PERFORMANCE OF CROSSBRED COLOUR LINE AND AUSTRA-WHITE CHICKEN FOR LAYER TRAITS

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Thesis submitted in partial fulfilment of the requirement for the degree of

Master of Veterinary Science

Faculty of Veterinary and Animal Sciences
Kerala Agricultural University, Thrissur

2003

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DECLARATION

I hereby declare that this thesis entitled "PERFORMANCE OF CROSSBRED COLOURLINE AND AUSTRA-WHITE CHICKEN FOR LAYER TRAITS", is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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Certified that thesis, entitled "PERFORMANCE OF CROSSBRED COLOULINE AND AUSTRA-WHITE CHICKEN FOR LAYER TRAITS" is a record of research work done independently by P. Sasikumar, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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ACKNOWLEDGEMENTS

With great devotion and respect, I wish to record my deepest gratitude and indebtness to ***Dr. Leo Joseph****, Associate Professor and Head, University Poultry and Duck Farm, Mannuthy, Chairman of the Advisory Committee, for his guidance, critical advice, sustained encouragement and much more which enabled the successful completion of this study.*

I would like to express my deep sense of gratitude to ***Dr.A. Jalaludeen****, Director, Centre for Advanced Studies in Poultry Science, for the valuable suggestion, extra-ordinary assistance and timely help rendered during the course of my study and also in the preparation of this manuscript.*

I express my thanks with gratitude to ***Dr.K.Narayanankutty****, Senior Scientist, AICRP on Poultry, for his words of inspiration, kindness and professional guidance throughout all hardships during the course of my study.*

My sincere thanks to ***Dr.K.C.Raghavan****, Associate Professor, Department of Animal Breeding and Genetics, for his incessant help and motivation as member of the Advisory Committee.*

I am highly grateful to ***Dr. P.A. Peethambaran****, Associate Professor, CASPS,* ***Dr. Amritha Viswanath*** *and* ***Dr.V.K. Elizabeth****, Associate Professors, Department of Poultry Science, for their kind help.*

I am immensely thankful to ***Dr.P.Veeramani****,* ***Dr.Richard Churchil*** *and* ***Dr.P.Anitha*** *Assistant Professors, Department of Poultry Science for their support and assistance during all my needs.*

I am very much thankful to the staff and workers of University Poultry and Duck Farm, Mannuthy for the help and co-operation rendered by them.

I extend my thanks to the Dean, College of Veterinary and Animal Sciences, Mannuthy for providing all the essential facilities for the research work.

I would like to express a word to all my Departmental colleagues ***Ravi, Giri*** *and* ***Renjith*** *and also thanks are extended to* ***Sathasivam*** *and* ***Cijo.***

I sincerely acknowledge the co-operation rendered by ***Navas, John Lal,*** *Mrs.* ***Vilasini*** *and Mrs.* ***Thressia.***

I place on record a word to all my friends ***Dr.P.X.Antony, Suresh, Sekar, Sasikumar, Sakthivel*** *and* ***Hariharan.***

I am very much thankful for the immense help rendered by ***Uma*** *and* ***Geetha.***

Words are really insufficient to thank my friends ***Rajendran, Chitra, Yuvaraj, Vimal, Kousig, Israel, Prasanna, Bala, Kantharaj*** *and* ***Vidhya*** *for the memorable days in my college life.*

I shall always remember with a deep sense of gratitude the wholehearted help, moral support and suggestions offered by my colleague ***Shibi Thomas.***

Finally, I bow my head before my beloved father who have always been the source of inspiration and whose encouragement helped me for the successful completion of my study.

P. Sasikumar.

CONTENTS

Chapter No.	Title	Page No.
1.	INTRODUCTION	1
2.	REVIEW OF LITERATURE	3
3.	MATERIALS AND METHODS	18
4.	RESULTS	25
5.	DISCUSSION	57
6.	SUMMARY	66
	REFERENCES	69
	ABSTRACT	75

LIST OF TABLES

Table No.	Title	Page No.
1	Per cent composition of feed ingredients in the layer mash fed to the experimental birds	20
2	Per cent composition of the nutrients in the layer mash (on dry matter basis)	22
3	Period wise meteorological data of Mannuthy region from December 2002 to May 2003	26
4	Mean body weight in Austra-White and Colourline, g	28
5	Age at sexual maturity in Austra-White and Colourline, days	31
6	Week-wise mean hen housed egg number and per cent in Austra-White and Colourline from 21 to 40 weeks of age	33
7	Period-wise hen housed egg number and per cent in Austra-White and Colourline	37
8	Week-wise mean hen day egg number and per cent in Austra-White and Colourline from 21 to 40 weeks of age	40
9	Period-wise hen day egg number and per cent in Austra-White and Colourline	41
10	Period-wise mean egg weight in Austra-White and Colourline, g	43
11	Mean daily feed consumption in Austra-White and Colourline from 21 to 40 weeks of age, g	45
12	Feed conversion ratio in Austra-White and Colourline from 21 to 40 weeks of age, per dozen eggs	48
13	Feed conversion ratio from 21 to 40 weeks of age in Austra-White and Colourline, per kg egg mass	50
14	Per cent livability in Austra-White and Colourline from 21 to 40 weeks of age	52

Table No.	Title	Page No.
15	Egg quality traits in Austra-White and Colourline at 32 weeks of age	54
16	Economics of egg production over feed cost from 25 to 40 weeks of age in Austra-White and Colourline	56

LIST OF FIGURES

Fig. No.	Title	Page No.
1	Mean body weight in Austra-White and Colourline at 20 weeks of age	29
2	Mean body weight in Austra-White and Colourline at 40 weeks of age	30
3	Week-wise mean hen housed egg number in Austra-White and Colourline from 21 to 40 weeks of age	34
4	Period-wise hen housed egg number in Austra-White and Colourline	38
5	Period-wise mean egg weight in Austra-White and Colourline	44
6	Mean daily feed consumption in Austra-White and Colourline from 21 to 40 weeks of age	46
7	Feed conversion ratio in Austra-White and Colourline from 21 to 40 weeks of age	49
8	Per cent livability in Austra-White and Colourline from 21 to 40 weeks of age	53

LIST OF PLATE

Plate. No.	Title	Between Pages
1	Plumage colour and egg shell colour in Austra-White and Colourline	51&52

Introduction

1. INTRODUCTION

Backyard poultry keeping is an integral part of rural household management system in Kerala, which plays an important role in family economy. Most of the rural households especially women have been traditionally rearing poultry under backyard system for a long time to meet up their family requirement. The poultry population in the state has increased over the years but the demand for eggs still outstrips the supply, with the result that the eggs are transported from other states to Kerala.

Establishment of commercial layer farm is not feasible because of the initial high investment, unsteady market price of the egg and the higher cost of raw materials used for poultry feed. The topography and climatic factor of the state is suitable for semi-intensive system or free-range system of poultry rearing. The popularity of scavenging chicken has been diminished due to the low productivity of the native chicken. Most of the crossbreds (Gramalakshmi, Gramapriya, Krishipriya, Krishna-J and CARI-Gold) are developed for rural poultry production in India (Singh, 2003).

The backyard poultry populations can be pressured from many directions, i.e., disease, predation, insufficient feed, drinking water and poor housing. Native local fowls are mostly raised in this production system, which has acquired considerable adaptability to local climatic environments. They are good foragers, require less care to grow and highly resistant to many of the diseases. Majority of the people in rural areas have a strong preference for dark coloured birds, not from the aesthetic point of view but from the survival point of view. Coloured birds escape from the predators being camouflaged by their colour as against white or light coloured birds. Better immunocompetence has been reported for coloured birds in comparison to white plumage (Singh, 2003).

Improved native breeds or a cross of native breed with exotic would be a good proposition for the ideal replacement of native scavenging chicken for backyard poultry production. High yielding exotic breeds may not be suitable for this purpose since India is a tropical country. Their full production potential is not expressed due to tropical stress which may be manifested as decreased feed consumption, low egg production, reduction in feed efficiency and egg quality, accompanied by heavy mortality during the peak summer and humid months. To overcome these the Department of Poultry Science in Kerala Agricultural University has developed crossbred Colourline for backyard rearing. These birds have coloured plumage and lay brown colour egg.

In Kerala Austra-White crossbreds (Gramalakshmi) are popular for backyard rearing. Although they are good layers, their plumage colour is uniform with black spots on a dull white background, and lay tinted egg.

Therefore, the present study was undertaken to evaluate the production traits of crossbred Colourline chicken and compare them with those of Austra-White.

Review of Literature

2. REVIEW OF LITERATURE

2.1 BODY WEIGHT

The body weight in laying hen is more important because of its relation to feed consumption, sexual maturity and egg weight than its direct effect on economic return.

Kumar *et al.* (1971b) reported that Aseel x Rhode Island Red weighed 1007 g at 12 weeks of age and was heavier than other crosses of indigenous breeds and exotic breeds, which averaged 803.32 ± 37.64 g.

Huq *et al.* (1976) observed that White Cornish x desi was heavier and weighed 2814 g at sexual maturity whereas, White Leghorn x desi and New Hampshire x desi weighed 998 and 1700 g, respectively.

Jain *et al.* (1977) recorded that the body weight at 12 weeks of age in the crosses of desi and Rhode Island Red was higher than that of the crosses of desi and White Leghorn. The cross progenies of Rhode Island Red x desi averaged 769 g and its reciprocal 739 g, while reciprocal cross between White Leghorn and desi weighed 687 g and 706 g, respectively at 12 weeks of age.

Jain and Sharma (1977) reported a mean body weight of 1608 and 1244 g in males and females of desi x Rhode Island Red and 2017 and 1400 g in males and females of Rhode Island Red x White Leghorn, respectively at five months of age.

Radhakrishnan and Ramakrishnan (1982) recorded body weight of Australorp x White Leghorn as 1142 g and Rhode Island Red x White Leghorn as 1134 g at 20 weeks of age. At 40 weeks of age it was 1570 and 1472 g, respectively.

Nair and Bhattacharyya (1984) found the body weight of crosses between White Leghorn and Australorp as 1250 g and 1650 g at 20th and 40th week, respectively under backyard system.

Sah *et al.* (1984) recorded heavier body weight for desi x White Leghorn when compared with White Leghorn x desi. They also pointed out that desi x White Leghorn were similar to or heavier than White Leghorn.

Jain and Chowdhry (1985) reported that the crosses involving desi showed lower body weight than the exotic breeds and their crosses. The two way crosses involving desi birds registered an average body weight of 1230.85 g at five months of age and three way crosses recorded 1251 g.

Merat (1986) recorded the body weight of Naked Neck homozygous (NaNa), Naked Neck heterozygous (Nana) and Normal Neck (nana) birds as 1635, 1642 and 1632 g, respectively at 39 weeks of age.

Jayanthy (1992) reported that body weights of desi x New Rock were heavier than the desi x Austra-White at 20 and 40 weeks of age. The body weight were 1298.98 and 1007.29 g at 20 weeks of age and 1974.06 and 1445.36 g at 40 weeks of age, respectively.

Sharma *et al.* (1992) recorded the body weight of two strains of Rhode Island Red (RIR, RIW) and a White Leghorn (IWH) as 1433.78 ± 26.67, 1288.97 ± 27.04 and 1105.96 ± 14.30 g, respectively at 20 weeks of age whereas their body weights at 40 weeks of age were 1853.66 ± 48.12, 1771.28 ± 39.34 and 1328.60 ± 25.58 g, respectively. They also reported the body weight of reciprocal crosses (RIW x RIR, IWH x RIR and IWH x RIW) as 1399.67 ± 16.96, 1331.67 ± 19.28 and 1288.70 ± 35.40 g, respectively at 20 weeks of age. At 40 weeks of age, the body weights were 1914.36 ± 27.85, 1627.58 ± 26.56 and 1541.37 ± 41.50 g, respectively.

Beena (1995) reported that 'F' strain White Leghorn weighed on an average 944.85 and 1346.67 g, respectively at 20 and 40 weeks of age.

Sridharan (1998) observed the mean body weight of Austra-White at 20 and 44 weeks of age as 1181.50 g and 1477.45 g, respectively.

Haque and Howlider (2000) recorded the body weight of Naked Neck (desi) Rhode Island Red, White Leghorn and Fayoumi as 1120 , 1147, 910 and 970 g, respectively whereas their crosses desi x Rhode Island Red, desi x White Leghorn and desi x Fayoumi averaged 1275, 1130 and 1103 g, respectively.

John (2000) reported that the body weight of Naked Neck x New Hampshire were heavier than Naked Neck x White Leghorn at 20 weeks of age (1855.6 vs 1496.1 g) and also at 40 weeks of age (2436.7 and 2004.1 g).

Kadigi *et al.* (2001) reported the body weights of Black Australorp and Malawi local chicken as 2247 ± 61.90 and 1668 ± 58.88 g, respectively whereas their crosses Black Australorp x Malawi local chicken and Malawi local chicken x Black Australorp weighed 1859 ± 73 and 1802 ± 47.46 g, respectively.

Padhi *et al.* (2001) recorded the body weight of Naked Neck, Frizzle, Naked Neck x Synthetic broiler and Synthetic broiler x Frizzle as 900 ± 36, 860 ± 35,1429 ± 49 and 1365 ± 41 g, respectively at 20 weeks of age.

Prabhakaran *et al.* (2001) reported that the body weights for IWN, IWP strain and control population of White Leghorn were 1.330 ± 0.01, 1.421 ± 0.01 and 1.229 ± 0.01 kg at 20 weeks of age and 1.539 ± 0.02, 1.546 ± 0.02 and 1.445 ± 0.02 kg at 40 weeks of age, respectively.

Kumar *et al.* (2002) recorded the average body weight of Rhode Island Red as 1517.69 ± 0.40 and 1783.43 ± 0.73 g at 20 and 40 weeks of age, respectively.

Devi *et al.* (2003) observed that the body weight of Rhode Island Red x White Leghorn as 1123 g at 20 weeks of age 1492 g at 40 weeks of age.

2.2 AGE AT SEXUAL MATURITY

The data obtained from Rhode Island Red, desi x Rhode Island Red and Rhode Island Red x desi hens were compared by Acharya and Kumar (1971) and observed that the age at first egg was 218, 216 and 202 days in Rhode Island Red, desi x Rhode Island Red and Rhode Island Red x desi hens, respectively.

Lal and Chhabra (1975) observed that the age at first egg averaged 182, 168, 187, 180, 185, 174 and 185 days in Australorp, Australorp x New Hampshire, Australorp x White Cornish, New Hampshire x Australorp, New Hampshire, White Cornish x Australorp and White Cornish, respectively.

Huq *et al.* (1976) stated that White Leghorn x desi crosses attained 20 per cent production at 213 days of age followed by New Hampshire x desi and White Cornish x desi which took 240 and 274 days, respectively to attain same level of production.

Mishra *et al.* (1978) observed that the age at sexual maturity of Rhode Island Red was 197.39 days.

Kumar and Acharya (1980) recorded mean age at sexual maturity in desi birds as 208.76 days.

Islam *et al.* (1981) reported that fourth generation grades of desi x White Leghorn matured at 210 days of age, while that of desi x New Hampshire matured at 236 days of age. The fifth generation grades of desi x White Leghorn matured earlier at 195 days, while that of desi x New Hampshire matured at 220 days of age.

Radhakrishnan (1981) reported the mean age at first egg in 'F' strain White Leghorn as 157.8 days, while the age at 50 per cent production was 182.6 days.

Radhakrishnan and Ramakrishnan (1982) observed that the overall mean age at first egg were 161.0 and 161.2 days for Australorp x White Leghorn and Rhode Island Red x White Leghorn crosses and age at 50 per cent production averaged 171.0 and 177.2 days, respectively.

Nair and Bhattacharyya (1984) observed that the age at first egg averaged 147.6 days and age at 50 per cent production averaged 175 days in Australorp x White Leghorn cross under backyard system.

Sah *et al.* (1985) recorded the age at sexual maturity of desi, White Leghorn x desi, desi x White Leghorn and White Leghorn as 203.22, 184.27, 171.06 and 165.9 days, respectively which showed intermediary values for crossbreds.

Jayanthy (1992) reported the age at 50 per cent production in desi x New Rock and desi x Austra-White crossbreds as 184 and 189 days, respectively.

Sharma *et al.* (1992) found the age at sexual maturity of two strains of Rhode Island Red (RIR, RIW) and White Leghorn (IWH) as 168.69 ± 1.93, 182.54 ± 1.64 and 146.00 ± 1.14 days, respectively whereas their reciprocal crosses RIW x RIR, IWH x RIR and IWH x RIW recorded 154.98 ± 1.29, 141.27 ± 1.02 and 141.27 ± 1.27 days, respectively.

Beena (1995) reported an average age at first egg as 174.67 days in 'F' strain of White Leghorn reared in cages at University Poultry Farm, Mannuthy.

Sridharan (1998) recorded that the average age at first egg was 161.63 days in Austra-White and 159.75 days in Rhode White hens. The mean ages at 10 and 50 per cent production were 166.25 and 179.13 days in Austra-White and 163 and 176.75 days in Rhode White, respectively.

Jayasree (2000) reported that New Hampshire and indigenous Naked Neck birds laid their first egg at the same age of 161 days. New Hampshire attained 50 per cent production at 175.5 days of age, while Naked Neck attained the same level of production in 176.55 days.

Kadigi *et al.* (2001) reported the age at sexual maturity of Black Australorp and Malawi Local chicken as 154 ± 3.82 and 158 ± 3.67 days, respectively whereas

Black Australorp x Malawi Local chicken and Malawi Local chicken x Black Australorp recorded 160 ± 4.01 and 153 ± 3.18 days, respectively.

Padhi *et al.* (2001) observed the age at sexual maturity of Naked Neck, Frizzle, Naked Neck x Synthetic broiler and Synthetic broiler x Frizzle as 189 ± 3.01, 192 ± 4.03, 178 ± 3.01 and 186 ± 3.91 days, respectively.

Prabhakaran *et al.* (2001) recorded the age at sexual maturity of IWN, IWP strain and control population of White Leghorn as 149.53 ± 0.89, 136.41 ± 0.89 and 153.85 ± 0.90 days, respectively whereas for 50 per cent production, the value were 153, 143 and 162 days, respectively.

Kumar *et al.* (2002) found that the age at sexual maturity in Rhode Island Red averaged 149.18 ± 0.41 days.

Devi *et al.* (2003) recorded that the age at sexual maturity of Rhode Island Red x White Leghorn was 155 days.

Kataria *et al.* (2003) observed that the age at sexual maturity in Rhode Island Red averaged 151.69 days.

2.3 EGG PRODUCTION

Acharya and Kumar (1971) reported a hen day per cent of 33.31 in desi x Rhode Island Red, 28.78 in Rhode Island Red x desi, 27.47 in Rhode Island Red and 22.8 in desi, for a period of three months.

Aggarwal and Sapra (1972) reported an average hen-day production of 26.44 and 22.19 eggs in desi and Naked Neck birds, respectively.

Mishra *et al.* (1978) observed that the egg production of Rhode Island Red flock was 55.48 upto 280 days of age.

Islam *et al.* (1981) recorded the annual egg production of White Leghorn x desi, New Hampshire x desi and White Cornish x desi as 116, 135 and 114 eggs,, respectively.

Chowdhury *et al.* (1983) reported that the egg production per month per hen averaged 8.7, 9.6, 13.3 and 11.1 in White Leghorn x Rhode Island Red, Rhode Island Red x White Leghorn, White Leghorn and Rhode Island Red, respectively.

Nair and Bhattacharya (1984) recorded an average production of 195 eggs in White Leghorn x Australorp, for a period of one year

Sah *et al.* (1985) observed that hen-day egg production averaged 19.11, 26.82, 32.09 and 41.83 per cent in desi, White Leghorn x desi, desi x White Leghorn and White leghorn birds, respectively, up to 240 days of age.

Merat (1986) recorded that the egg production of Naked Neck homozygous (NaNa), Naked Neck heterozygous (Nana) and normal neck (nana) were 115.2, 117.9 and 112.0, respectively upto 39 weeks of age.

Dey *et al.* (1987) reported the egg number upto 280 days of age as 84.13 in L-55 x Rhode Island Red cross. The annual egg number in the cross was found to have significant and negative correlation with age at sexual maturity.

Babu *et al.* (1988) reported a hen-housed number of 46.23 (33.02 per cent) and a hen day production of 46.82 (33.44 per cent) in Austra-White pullets reared in cages from 21 to 40 weeks of age.

Jayanthy (1992) reported hen-housed number of 37.61 and 34.4 in desi x New Rock and desi x Austra-White crosses. The hen day number were 47.61 and 47.81, respectively.

Sharma *et al.* (1992) observed that the egg number upto 280 days of age in two strains of Rhode Island Red (RIR, RIW) and White Leghorn (IWH) was 82.91 ± 3.08, 66.97 ± 2.28 and 93.15 ± 2.41, respectively. The crosses RIW x RIR, IWH x

RIR and IWH x RIW averaged 77.98 ± 2.54, 94.86 ± 3.32 and 94.87 ± 4.24 eggs, respectively.

Sridharan (1998) reported a mean egg production of 82.98 eggs (49.39 per cent) in Austra-White and 98.80 eggs (58.81 per cent) in Rhode White on hen housed basis. The hen day number was 85.72 (51.02 per cent) in Austra- White and 101.21 (60.24 per cent) in Rhode White.

Jayasree (2000) reported that hen-housed egg number averaged 66.41 in New Hampshire and 72.13 in Naked Neck, from 25 to 40 weeks of age.

Kadigi *et al.* (2001) recorded the hen housed egg production of Black Australorp, Malawi local chicken, Black Australorp x Malawi local chicken and Malawi local chicken x Black Australorp as 33 ± 1.26, 17 ± 1.17, 24 ± 1.21 and 20 ± 1.18 *per cent*, respectively.

Padhi *et al.* (2001) reported an annual egg production of 98 ± 8 and 89 ± 6 in Naked Neck and Frizzle, respectively in Andaman and Nicobar islands.

Prabhakaran *et al.* (2001) reported that the hen housed per cent in IWN, IWP strains and control population of White Leghorn was 65.48, 60.50 and 64.42, respectively.

Kumar *et al.* (2002) found that the egg production of Rhode Island Red upto 280 days averaged 112.49 ± 0.54 eggs.

Devi *et al.* (2003) reported that Rhode Island Red x White Leghorn averaged 90 and 91 eggs on hen housed and survivors basis at 40 weeks of age, respectively.

Kataria *et al.* (2003) observed an egg production of 87.95 eggs in Rhode Island Red upto 40 weeks of age.

Sahoo *et al.* (2003) reported that the hen day per cent in Rhode Island Red, Colour and B77 varieties was 73.17 ± 1.00, 43.45 ± 4.90 and 42.80 ± 2.02, respectively from 24 to 50 weeks of age.

2.4 EGG WEIGHT

Kumar *et al.* (1971a) recorded an egg weight of 54.29, 47.04, 51.06 and 51.02 g, respectively in Rhode Island Red, desi, desi x Rhode Island Red and Rhode Island Red x desi birds at eight months of age.

Aggarwal and Sapra (1972) reported an egg weight of 33.3 g in Naked Neck birds at eight month of age.

Jain *et al.* (1978b) recorded an egg weight in desi, desi x White Leghorn and desi x Rhode Island Red averaged 41.42, 48.16 and 48.97 g, respectively.

Mishra *et al.* (1978) observed that the egg weight in Rhode Island Red at 38 weeks of age averaged 50.88 ± 0.14 g.

Islam *et al.* (1981) recorded an egg weight of 52.2, 52.0 and 57.3 g in crosses of indigenous chicken with White Leghorn, New Hampshire and White Cornish breeds of fowl, respectively.

Radhakrishnan and Ramakrishnan (1982) reported that the mean egg weight in White Leghorn, Australorp, White Leghorn x Australorp, Australorp x White Leghorn was 53.2, 43.6, 46.2 and 48.8 g, respectively at 40 weeks of age.

Chowdhury *et al.* (1983) found the average egg weight as 46.8 g in White Leghorn x Rhode Island Red cross. In White Leghorn the mean egg weight was 45.6 g and in Rhode Island Red, it was 46.7 g.

Nair and Bhattacharya (1984) reported an average egg weight of 52 g with a range of 40 to 60 g at 40 weeks of age in White Leghorn x Australorp cross under backyard system.

Sah *et al.* (1985) recorded an average weight of first egg in desi birds as 22.66 g, while it was 35.57 and 31.36 g in progenies of desi x White Leghorn cross and White Leghorn x desi cross, respectively.

Merat (1986) recorded that egg weight of Naked Neck homozygous (NaNa), Naked Neck heterozygous (Nana) and Normal Neck (nana) were 52.6, 52.0 and 51.3, respectively at 40 weeks of age.

Chand (1987) recorded that the egg weight in White Plymouth Rock, White Cornish and New Hampshire was 54.25, 52.72 and 49.47 g, respectively.

Dey *et al.* (1987) observed an egg weight of 50.16 g at 40 week of age in White Leghorn (L-55) x Rhode Island Red cross.

Pandey *et al.* (1987) reported that egg weight in Rhode Island Red averaged 54.34 g.

Babu *et al.* (1988) found that egg weight averaged 43.81 g at 24 weeks of age and 45.62 g at 40 weeks of age in Austra-White pullets in cages.

Padhi *et al.* (1998) recorded that the egg weight of Naked Neck was 56.31 ± 1.51 g.

Salahuddin and Howlider (1991) reported an average egg weight of 53.53 g in Naked Neck fowl at 40 weeks of age.

Jayanthy (1992) reported that eggs of desi x New Rock crosses were consistently heavier than that of desi x Austra-White crosses, at all ages of measurement. The initial egg weight of 36.67 ± 0.81 in desi x New Rock cross progressively increased to 46.74 ± 0.39 g at 37.40 weeks of age. Egg weight in desi x Austra-White cross increased from an initial value of 36.25 ± 0.67 g to a final egg weight of 44.88 ± 0.42 g at 37 to 40 weeks of age.

Sharma *et al.* (1992) observed that the egg weight of two strains of Rhode Island Red (RIR, RIW) and a White Leghorn strain at 32 weeks of age was 48.12 ± 0.48, 49.94 ± 0.63 and 46.96 ± 0.35 g, respectively whereas their crosses RIW x RIR, IWH x RIR and IWH x RIW averaged 49.51 ± 0.39, 47.71 ± 0.38 and 48.31 ± 0.45 g, respectively.

Sridharan (1998) recorded an overall mean egg weight as 48.02 g in Austra-White and 46.50 g in Rhode White from 21 to 44 weeks of age.

Jayasree (2000) observed a mean egg weight of 50.44 g in New Hampshire, while a significantly higher egg weight of 53.36 g was observed in Naked Neck birds during the period from 25 to 40 weeks of age. At 40 weeks of age the New Hampshire and Naked Neck eggs weighed 52.82 and 55.85 g, respectively.

Prabhakaran *et al.* (2000) reported that the egg weight in IWN and IWP strains and a control population of White Leghorn was 50.40, 49.40 and 46.56 g, respectively.

Haque *et al.* (2001) observed that egg weight in Naked Neck desi, Rhode Island Red, White Leghorn and Fayoumi was 45, 58, 53.75 and 46.75 g, respectively whereas Naked Neck desi x Rhode Island Red, Naked Neck desi x White Leghorn and Naked Neck desi x Fayoumi averaged 49.75, 51.50 and 48.50 g, respectively.

Kumar (2002) reported an average egg weight of Rhode Island Red as 50.82 ± 0.13 g at 35 weeks of age.

Sahoo *et al.* (2003) observed that the egg weight in Rhode Island Red, Colour and B77 strains averaged 50.72 ± 1.95, 55.00 ± 1.03 and 56.22 ± 0.96 g, respectively.

2.5 FEED CONSUMPTION AND FEED CONVERSION RATIO (FCR)

Jain *et al.* (1978b) recorded the FCR of 3.79 (Feed per dozen eggs) in desi birds, while crosses involving desi x White Leghorn and desi x Rhode Island Red Island Red showed the FCR of 3.149 and 2.887, respectively.

Howlider and Ahmed (1982) found that FCR averaged 2.76 and 2.80 in Australorp x New Hampshire and Aseel x Australorp, respectively.

Merat (1986) recorded that the feed efficiency in Naked Neck homozygous (NaNa), Naked Neck heterozygous (Nana) and Normal Neck (nana) was 3.23, 3.24 and 3.19, respectively.

Dey *et al.* (1987) compared the production traits between the White Leghorn strain cross and White Leghorn x Rhode Island Red cross and found that the annual feed consumption per day did not differ between crosses.

Jayanthy (1992) reported daily mean feed consumption of 95.71 and 91.21 g during 21 to 24 weeks of age and 124.76 and 107.42 g during 37 to 40 weeks of age in desi x New Rock and desi x Austra-White crosses, respectively. The overall mean feed consumption was 106.61 g in desi x New Rock and 104.95 g in desi x Austra-White from 20 to 40 weeks of age. The overall FCR during 21 to 40 weeks of age were 4.09 and 4.93 for desi x New Rock and desi x Austra-White crosses, respectively.

Beena (1995) observed an average feed consumption of 93.83 g/bird/day with an overall FCR of 2.47 per dozen egg from 25 to 40 weeks of age in 'F' strain of White Leghorn.

Sridharan (1998) reported that FCR on the basis of dozen eggs was 2.60 in Austra-White and 2.05 in Rhode white from 21 to 40 weeks of age.

Jayasree (2000) recorded an overall mean daily feed consumption of 123.06 g in New Hampshire and 123.46 g in Naked Neck for the period from 21 to 40 weeks of age. Mean feed conversion ratio per dozen eggs from 25 to 40 weeks of age in New Hampshire was 2.6, while it was 2.45 in Naked Neck birds.

Sahoo *et al.* (2003) observed that the feed per kg egg mass in Rhode Island Red, Colour and B77 strain was 2.99 ± 0.10, 5.19 ± 1.45 and 5.54 ± 0.95, feed per dozen eggs was 1.81 ± 0.02, 3.37 ± 0.57 and 3.80 ± 0.52, respectively.

2.6 LIVABILITY

The livability per cent reported by Acharya and Kumar (1971) in desi, Rhode Island Red x desi, Rhode Island Red and desi x Rhode Island Red was 62.57, 66.25, 72.90 and 77.67, respectively.

Huq *et al.* (1976) recorded an average livability of 87, 86 and 82 per cent in White Leghorn x desi, New Hampshire x desi and White Cornish x desi birds respectively, upto 16 weeks of age.

Radhakrishnan (1981) stated that the livability percentage upto 40 weeks of age was 96 in Australorp x White Leghorn while in Rhode Island Red x White Leghorn cross it was 76 per cent under backyard condition.

Howlider and Ahmed (1982) concluded that livability was 85.72 per cent in Australorp x New Hampshire and 80.96 per cent in Aseel x Australorp cross.

Sah *et al.* (1984) reported better livability in White Leghorn (79.07 per cent) followed by desi x White Leghorn (76.03 per cent), desi (69.36 per cent) and White Leghorn x desi (63.04 per cent) birds for a period up to 240 days of age under farm condition.

Jayanthy (1992) recorded livability percentage of 69.39 and 62.50 for desi x New Rock and desi x Austra-White crosses, respectively during 21 to 40 weeks of age.

Sridharan (1998) reported that the livability percent from 21 to 44 weeks of age were 89.17 and 95.83 per cent in Austra-White and Rhode White, respectively.

Jayasree (2000) reported that the livability in New Hampshire during 21 to 40 weeks of age was 91.66 per cent, while in Naked Neck birds it was 93.33 per cent, the difference being statistically non significant.

Padhi *et al.* (2001) observed that the livability in Naked Neck and Frizzle were 86 and 84 per cent, respectively.

2.7 EGG QUALITY

Kumar *et al.* (1971a) reported shape index and Haugh Unit score of 74.28 ± 0.26 and 76.32 ± 0.70 in Rhode Island Red x desi, respectively.

Jain *et al.* (1978a) obtained Haugh Unit score of 68.86,76.98,74 and 72.44 in Rhode Island Red x White Leghorn, Rhode Island Red x desi, desi x White Leghorn and desi x Rhode Island Red, respectively.

Pandey *et al.* (1987) reported the indices of shape, albumen, yolk, and Haugh Unit score in Rhode Island Red were 74.52, 0.074, 0.443 and 79.18, respectively.

Salahuddin and Howlider (1991) recorded the Haugh Unit score in Rhode Island Red and White Leghorn as 82.55 and 83.49, respectively. The shell thickness averaged 0.3435 and 0.3455 mm, respectively.

Jayanthy (1992) reported a shell thickness of 0.396 and 0.403 mm and Haugh Unit score of 86 and 85 for desi x New Rock and desi x Austra-White crosses, respectively.

Padhi *et al.* (1998) reported indices of shape, albumen, yolk, Haugh Unit score and shell thickness of Naked Neck as 75.36 ± 1.33, 0.0705 ± 0.00, 0.4323 ± 0.01, 73.16 ± 3.85 and 0.3062 ± 0.01 mm, respectively.

Sridharan. (1998) reported that mean shell thickness averaged 0.42 mm in Austra-White and 0.41 mm in Rhode White eggs.

Jayasree (2000) recorded a mean shell thickness of 0.44 mm in New Hampshire and 0.48 mm in Naked Neck eggs. The mean indices of shape, albumen and yolk were 81.34, 0.09 and 0.36 in New Hampshire and 81.32, 0.07 and 0.34 in Naked Neck, respectively. The mean Haugh unit score was 87.16 in New Hampshire and 80.58 in Naked Neck.

Haque *et al.* (2001) recorded the yolk indices of Naked Neck local, Rhode Island Red, White Leghorn and Fayoumi as 0.40, 0.41, 0.40 and 0.40, respectively.

Materials and Methods

3. MATERIALS AND METHODS

An experiment was conducted at Kerala Agricultural University Poultry Farm, Mannuthy, to evaluate and compare the egg production traits of Austra-White and Colourline crossbred chicken under deep litter system of rearing.

AUSTRA-WHITE

Austra-White is a crossbred chicken with Australorp breed as male line and White Leghorn breed as female line. This crossbred was developed for backyard rearing at University Poultry Farm and was released in 1980 after field trials. The parent lines are maintained at University Poultry Farm. A batch of Austra-White hatched during August 2002 was utilised for the study.

COLOURLINE

Colourline is an experimental crossbred developed at University Poultry Farm, for backyard rearing. The bird is multicoloured with medium body size and brown egg shell. The parent lines involved are Naked Neck and Rhode Island Red breeds maintained at University Poultry Farm. Reciprocal crosses were made between the breeds and the normal necked were separated. They were mated inter-se for two generations. The third generation chicks were hatched during August 2002 concurrently with Austra-White, were utilised for the study. The experimental chicks in the two groups were reared in separate pens on litter floor under standard management conditions upto 18 weeks of age.

One hundred pullets each of Austra-White and Colourline were utilised for the study. The experiment consisted of ten replicates, each with ten birds for each groups. The pullets were allotted to the replicates and the replicates were allotted to pens at random. The layer pens of 140 x 180 cm provided 2380 cm^2 for each bird under deep litter system of rearing. The experimental birds were housed in the layer

house at 18 weeks of age. They were administered a booster dose of Ranikhet disease vaccine at the time of housing.

The experimental period ranged from 21 to 40 weeks of age and was divided into five periods, each of 28 days duration. The body weight was recorded individually at 20 and 40 weeks of age and the birds were reared during the period from December 2002 to May 2003. Experimental birds were fed standard layer mash as per BIS (1993), *ad libitum*. Shell grit was offered *ad libitum* in the pens. The ingredient composition of the feed is presented in Table 1. The proximate composition of the ration was estimated according to procedure described in AOAC (1990) and the per cent proximate composition of nutrients in the layer mash is presented in Table 2.

The following observations were recorded during the course of the experiment.

3.1 BODY WEIGHT

Body weight of birds at 20 and 40 weeks of age was recorded individually to the nearest 10 g. (BW 20 and BW 40).

3.2 AGE AT SEXUAL MATURITY (ASM)

The age at first egg and age at 50 per cent production (days) were recorded in each replicate and from the data, mean age at sexual maturity were determined.

3.3 EGG PRODUCTION

Egg production was recorded daily, from 21 to 40 weeks of age. It was expressed as hen housed and hen day production, replicate wise and period wise.

Table 1. Per cent composition of feed ingredients in the layer mash fed to the experimental birds.

Sl. No.	Ingredient	Per cent
1	Yellow maize	50.3
2	Rice polish	10.8
3	Soyabean meal	11.7
4	Groundnut cake	5.0
5	Gingelly oil cake	5.0
6	Dried fish	10.0
7	Shell grit	5.0
8	Salt	0.2
9	Mineral mixture*	2.0
	Supplement	(g)
1	Lysine	250
2	Methionine	250
3	Choline	500
4	Indomix A+ B2+ D3 **	15
5	Indomix B+E ***	15

* Keyes mineral mixture without salt (KSE Ltd., Irinjalakuda)

Ingredients : Calcium – 24.0%, Phosphorus – 12.0%, Magnesium – 6.5%, Sulphur – 0.5%, Iron – 0.5%, Zinc – 0.38%, Manganese – 0.15%, Copper – 0.5% Iodine – 0.03%, Cobalt – 0.02%, Fluorine (max) – 0.04% ,Acid insoluble ash (max) – 2% and moisture – 4%

** Indomix $A+B_2+D_3$ (Nicholas Piramal India Ltd., Mumbai)

Composition per gram : Vitamin A – 40,000 IU, Vitamin B_2 – 20 mg, Vitamin D_3 – 5000 IU

*** Indomix – BE (Nicholas Piramal India Ltd., Mumbai)

Composition per gram :Vitamin B_1 – 4 mg, Vitamin B_6 – 8 mg, Vitamin B_{12} – 40 mcg, Niacin – 60 mg, Calcium pentothenate – 40 mg, Vitamin E – 40 mg.

Table 2. Per cent composition of the nutrients in the layer mash (on dry matter basis)

Sl. No.	Content	Per cent
1	Dry matter	88.92
2	Crude protein	17.68
3	Crude fibre	5.28
4	Ether extract	5.31
5	Nitrogen free extract	57.98
6	Total ash	13.75
7	Acid insoluble ash	5.82
8	Calcium	3.18
9	Phosphorus	0.76
10	Calculated ME (kcal/kg)	2698

3.4 EGG WEIGHT

Individual weight of all eggs laid during last three days of each 28-day period was weighed to the nearest 0.01 g. The mean egg weight was calculated for each replicate.

3.5 FEED CONSUMPTION

The weight of feed issued was recorded for each replicate. The balance feed available in the feeders at the end of each period was recorded. From this data, period-wise mean daily feed consumption per bird was worked out.

3.6 LIVABILITY

The period-wise per cent livability was recorded based on the number of birds alive during each period.

3.7 PLUMAGE COLOUR AND EGGSHELL COLOUR

Plumage and eggshell colour were recorded in Austra-White and Colourline chicken.

3.8 EGG QUALITY

Five eggs were collected at random from each replicate at 32 weeks of age for egg quality studies. The egg quality parameters were shape index, yolk index and albumen index, Haugh Unit score and shell thickness. The heights of albumen and yolk were measured by using Ame's tripoid stand micrometer. The widths of the yolk and albumen were measured by using hand slide calipers. Shell thickness was measured by using shell thickness measuring gauge to the nearest 0.01 mm.

3.9 ECONOMICS

The economics of egg production over feed cost was calculated taking into account the cost of feed ingredients prevailed at the local market.

The data were analysed statistically as per the method described by Snedecor and Cochran (1985). All the tests of difference between means were conducted at the five per cent probability level.

Results

4. RESULTS

The results of the experiment conducted to evaluate and compare the production performance of Austra-White and Colourline for layer traits are presented in this chapter.

4.1 METEOROLOGICAL PROFILE

The experiment period from 21 to 40 weeks of age was divided into five periods (I to V) and the meteorological data for each 28 day periods commencing from 20th December 2002 to 8th May 2003 are presented in Table 3. The mean daily maximum temperature during these periods ranged between 33.2°C (period I) and 34.7°C (period II). The mean maximum temperature during the entire period of experiment was similar and the differences were narrow.

The mean daily minimum temperature ranged between 22.9°C and 25°C. The lowest was recorded in period I (22.9°C) and the highest was observed in period IV and V (25°C).

The per cent relative humidity (R.H) in the forenoon ranged from 66 to 88. The R.H in the first period (66 per cent) was lower compared to the rest of the periods. In the subsequent four periods the per cent R.H values were similar.

The R.H in the afternoon ranged from 34 to 58. The R.H for the initial period (34 per cent) was lower than that of other four periods. The R.H values for the period II and III were close (43 and 47 per cent, respectively) and period IV and V (58 and 56 per cent, respectively) were also similar.

The mean daily sunshine hours during the initial two periods were higher than those values recorded in subsequent periods. The mean values ranged from 3.2 (period III) to 9.7 h/day (period I). The mean values of daily wind velocity ranged between 3.2 kmph (period IV) to 8.6 kmph (period I). The mean total rainfall for the period I was zero. Highest rainfall recorded in period II was

Table 3. Period wise meteorological data of Mannuthy region from December 2002 to May 2003

Period	Month (age in weeks)	Temperature (°C)		Relative Humidity (per cent)		Wind velocity (kmph)	Sunshine hours (Mean)	Total rainfall (mm)
		Max	Min	F.N	A.N			
I	Dec-02 to Jan-03 (21-24)	33.2	22.9	66	34	8.6	9.7	0
II	Jan-Feb (25-28)	34.7	23.6	83	43	5.1	8.6	162.1
III	Feb-Mar (29-32)	34.6	24.1	86	47	3.7	3.2	94.8
IV	Mar-Apr (33-36)	34.6	25.0	86	58	3.2	7.5	23.8
V	Apr-May (37-40)	34.0	25.0	88	56	3.8	6.5	40.3

162.1mm. In the period III the rainfall was 94.8 mm and in the subsequent periods, IV and V, it was low (23.8 and 40.3 mm, respectively).

4.2 BODY WEIGHT

The mean body weights recorded at 20th and 40th week of age are presented in Table 4. The overall mean body weight at 20th week of age was 1215.6 ± 20.61 g in Austra-White and 1493.65 ± 14.02 g in Colourline. The mean body weight in different replicates of Austra-White varied from 1079.0 ± 59.07 g to 1296.5 ± 28.09 g and the same in Colourline varied from 1434.0 ± 84.89 g to 1559.5 ± 44.18 g at 20th week of age. The overall mean body weight at 40th week was 1424.40 ± 28.01 g and 1863.15 ± 13.46 g in Austra-White and Colourline, respectively. The mean body weight in different replicates of Austra-White varied from 1301.5 ± 40.79 g to 1567.22 ± 45.43 g and in Colourline it varied from 1783.0 ± 54.03 g to 1947.0 ± 57.87 g at 40th week. The body weight at 20th and 40th week of age showed that the Colourline birds were heavier than Austra-White during the experimental period. The differences in body weight between Austra-White and Colourline at 20th and 40th week was significant ($P<0.05$).

The mean body weight recorded at 20th and 40th week is depicted in Fig. 1 and 2.

4.3 AGE AT SEXUAL MATURITY

The ages at first egg in the flock as well as the age at 50 per cent production are presented in Table 5. The age at first egg ranged from 147 days to 169 days in replicates with an overall mean of 158.9 ± 2.26 days in Austra-White whereas in Colourline it varied from 153 days to 168 days with an overall mean of 158.9 ± 1.96 days. The overall mean of age at first egg in both the flocks were same.

Table 4. Mean body weight in Austra-White and Colourline, g

Replicate Number	BW 20		BW 40	
	Austra-White	Colourline	Austra-White	Colourline
1	1154.50 ± 22.02	1444.50 ± 51.28	1344.00 ± 31.88	1860.00 ± 71.23
2	1275.50 ± 27.16	1470.50 ± 73.67	1567.22 ± 45.43	1880.50 ± 86.59
3	1234.00 ± 23.72	1559.50 ± 44.18	1487.50 ± 48.70	1850.00 ± 59.20
4	1174.50 ± 38.19	1480.00 ± 36.40	1404.30 ± 41.50	1842.50 ± 65.71
5	1236.00 ± 51.01	1488.50 ± 57.77	1476.50 ± 54.30	1895.00 ± 59.14
6	1296.50 ± 28.09	1545.50 ± 40.99	1497.00 ± 44.53	1947.00 ± 57.87
7	1266.50 ± 42.81	1487.00 ± 42.17	1480.50 ± 77.79	1783.00 ± 54.03
8	1201.50 ± 24.25	1553.00 ± 32.64	1353.50 ± 78.20	1881.00 ± 51.12
9	1079.00 ± 59.07	1434.00 ± 84.89	1301.50 ± 40.79	1842.50 ± 32.83
10	1238.00 ± 48.01	1474.00 ± 44.89	1332.00 ± 57.43	1850.00 ± 49.80
Overall mean	1215.60 ± 20.61 [b]	1493.65 ± 14.02 [a]	1424.40 ± 28.01 [b]	1863.15 ± 13.46 [a]

The overall mean values carrying different superscripts within the trait differed significantly ($P<0.05$).

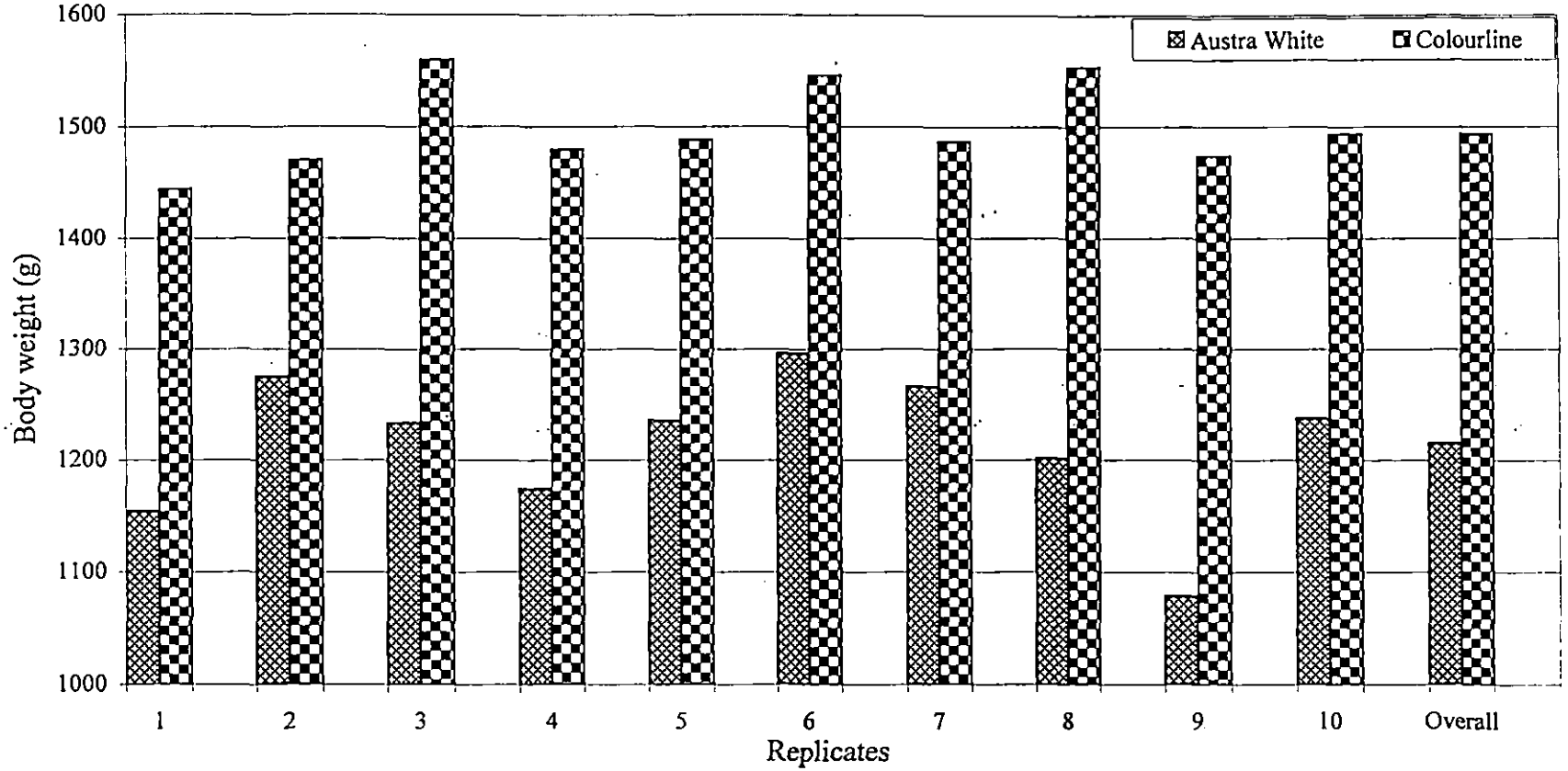

Fig. 1. Mean body weight in Austra-White and Colourline at 20 weeks of age

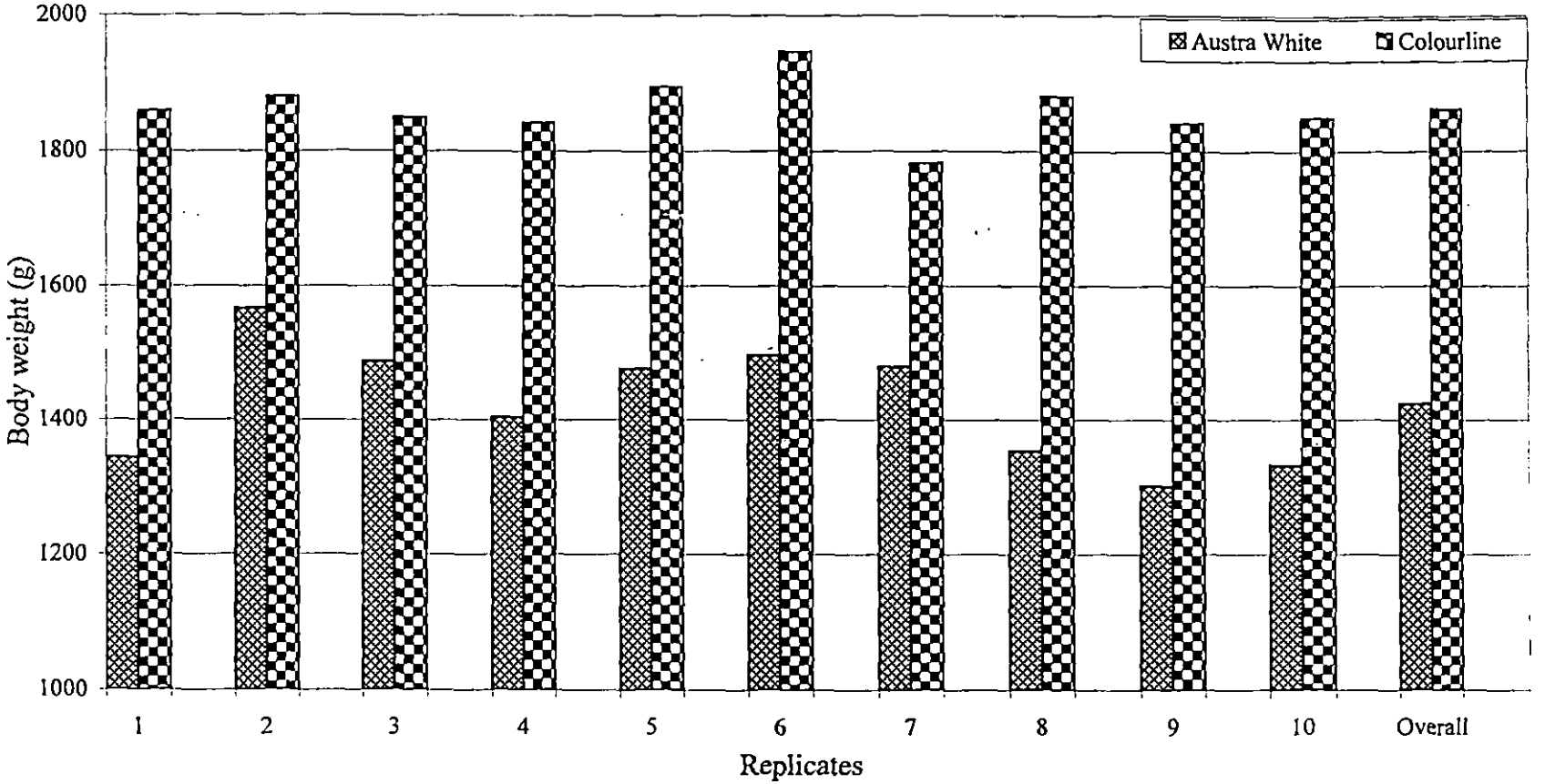

Fig. 2. Mean body weight in Austra-White and Colourline at 40 weeks of age

Table 5. Age at sexual maturity in Austra-White and Colourline, days

Replicates	Age at first egg (days)		Age at 50 per cent production (days)	
	Austra-White	Colourline	Austra-White	Colourline
1	169	168	177	179
2	162	155	173	175
3	151	154	170	175
4	160	165	184	182
5	153	166	180	170
6	161	154	182	175
7	166	153	179	175
8	147	154	176	171
9	165	155	175	170
10	155	165	181	179
Overall mean	158.9 ± 2.26	158.9 ± 1.96	177.7 ± 1.37	175.1 ± 1.28

The age at 50 per cent production in different replicates of Austra-White varied from 170 days to 184 days with an overall mean value of 177.7 ± 1.37 days. Whereas in Colourline the age at 50 per cent production varied from 170 to 182 days with an overall mean of 175.1 ± 1.28 days. These results showed that age at first egg in both the breeds was same, but the Colourline attained 50 per cent production two days earlier than Austra-White. The age at first egg and age at 50 per cent production showed no significant difference between Austra-White and Colourline.

4.4 EGG PRODUCTION

4.4.1 Weekly Hen Housed Egg Number (HHN) and Hen Housed Per Cent (HHP)

The week-wise mean HHN and HHP in Austra-White and Colourline are presented in Table 6 and Fig. 3.

The HHN and HHP in Austra-White at 21st, 22nd, 23rd and 24th weeks were 0.01 (0.14 per cent), 0.08 (1.14 per cent), 0.18 (2.57 per cent) and 0.86 (12.28 per cent), respectively. Whereas in Colourline the HHN and HHP they were 0, 0.04 (0.57 per cent), 0.19 (2.71 per cent) and 0.86 (12.29 per cent), respectively. The hen housed egg number and per cent during this period were very low and hence not included in the statistical analysis.

At 25th week the HHN in Austra-White was 1.69 (24.14 per cent). HHN registered an increase at 26th week with 2.96 (42.29 per cent). At 27th week HHN reached 4.34 (62.00 per cent). During the 28th week the HHN was 4.87(69.57 per cent).

The HHN of 5.40 (77.14 per cent) was recorded at 29th week. A marginal reduction in HHN was noticed during 30th week with 5.23 (74.71 per cent). The HHN reached maximum of 5.44 (77.71 per cent) at 31st week. Again a marginal reduction of HHN to 5.06 (72.29 per cent) was noticed at 32nd week. The HHN

Table 6. Week-wise mean hen housed egg number and per cent in Austra-White and Colourline from 21 to 40 weeks of age

Period	Age in weeks	Austra-White		Colourline	
		HHN	HHP	HHN	HHP
I	21	0.01	0.14	--	--
	22	0.08	1.14	0.04	0.57
	23	0.18	2.57	0.19	2.71
	24	0.86	12.28	0.86	12.29
II	25	1.69	24.14	1.89	27.00
	26	2.96	42.29	3.06	43.71
	27	4.34	62.00	4.14	59.14
	28	4.87	69.57	4.77	68.14
III	29	5.40	77.14	5.27	75.29
	30	5.23	74.71	5.56	79.43
	31	5.44	77.71	5.61	80.14
	32	5.06	72.29	5.61	80.14
IV	33	5.36	76.57	5.34	76.29
	34	5.10	72.86	5.49	78.43
	35	4.91	70.14	5.16	73.71
	36	4.84	69.14	5.09	72.71
V	37	4.73	67.57	5.20	74.29
	38	4.72	67.43	4.92	70.43
	39	4.42	63.14	4.84	69.14
	40	4.56	65.14	4.64	66.29
Overall	25-40	4.60 ± 0.24	65.74 ± 3.49	4.79 ± 0.25	68.39 ± 3.6
	21-40	3.74 ± 0.44	53.40 ± 6.32	4.09 ± 0.44	58.42 ± 6.58

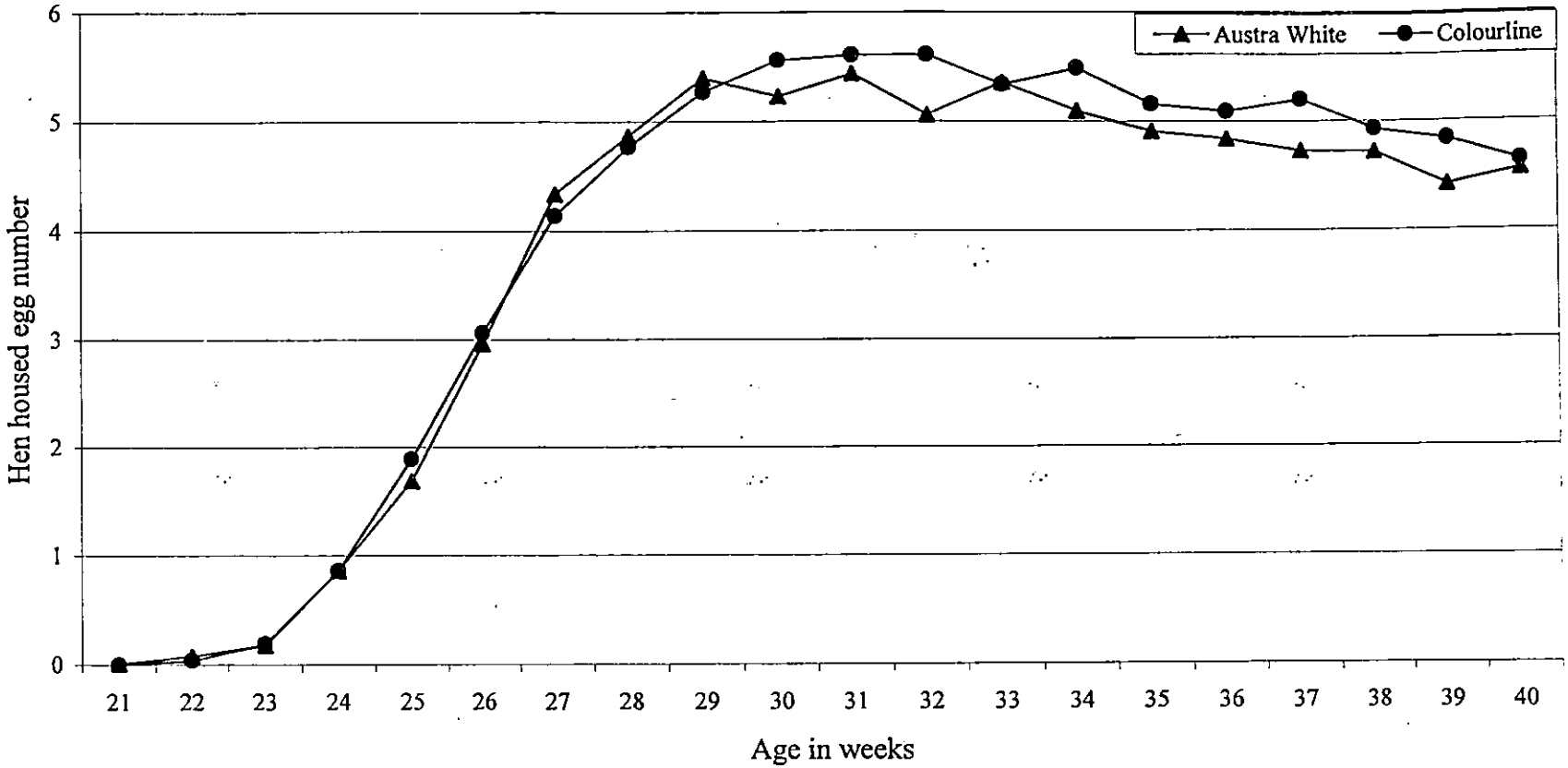

Fig. 3. Week-wise mean hen housed egg number in Austra-White and Colourline from 21 to 40 weeks of age

registered a further increase upto 5.36 (76.57 per cent) at 33rd week. From 34th week onwards the HHN started a decreasing trend with 5.10(72.86 per cent). The HHN at 35th and 36th week were 4.91 (70.14 per cent) and 4.84 (69.14 per cent), respectively.

The HHN was recorded as 4.73 (67.57 per cent) during 37th week of age. The HHN maintained the same in 38th week also with 4.72 (67.43 per cent). The HHN during the last two weeks of the experimental study i.e., at 39th and 40th week were 4.42 (63.14 per cent) and 4.56 (65.14 per cent), respectively.

In Colourline the hen housed egg number at 25th week of age was 1.89 (27.0 per cent). Thereafter a marked increase in HHN was noticed at 26th week (3.06). It rose to 4.14 (59.14 per cent) during 27th week. Further increase in HHN was noticed at 28th week with 4.77 (68.14 per cent).

The HHN at 29th week of age was 5.27 (75.29 per cent). A slight increase in HHN was noticed at 30th week with 5.56 (79.43 per cent). The maximum HHN of 5.61 (80.14 per cent) was recorded at 31st week and the same was maintained at 32nd week.

At 33rd week a reduction in HHN was noticed with 5.34 (76.29 per cent) and a slight increase in HHN was observed at 34th week with 5.49 (78.43 per cent). Thereafter a decreasing trend of HHN was noticed at 35th and 36th week with 5.16 (73.71 per cent) and 5.09 (72.71 per cent), respectively.

A slight increase in HHN was noticed at 37th week with 5.20 (74.29 per cent). It again decreased into 4.92 (70.43 per cent) at 38th week. The HHN during the last two weeks of experimental study, i.e., 39th and 40th week were 4.84 (69.14 per cent) and 4.64 (66.29 per cent), respectively.

The mean HHN from 21 to 40 weeks of age in Austra-White was 3.74 ± 0.44 (53.40 ± 6.32 per cent) and in Colourline it was 4.09 ± 0.44 (58.42 ± 6.5 per cent). The mean values did not differ significantly.

4.4.2 Period Wise Hen Housed Egg Number (HHN) and Per Cent (HHP)

Period-wise HHN and HHP in Austra-White and Colourline are presented in Table 7 and Fig. 4.

HHN in Austra-White during the first period of the experiment was 1.13 (4.04 per cent). During the same period in Colourline the HHN of 1.09 (3.89 per cent) recorded. The difference in HHN between Austra-White and Colourline was not significant statistically ($P<0.05$).

During the period II the HHN were same i.e., 13.86 (49.50 per cent) in Austra-White and Colourline.

The HHN for the period III in Austra-White was 20.82 (74.36 per cent). Though a higher hen housed number of 22.05 (78.75 per cent) was recorded in Colourline for the same period, they were statistically similar.

During the period IV the HHN was recorded as 20.20 (72.14 per cent) and 21.08 (75.29 per cent) in Austra-White and Colourline, respectively. Though the egg number was higher in Colourline it was statistically not significant.

Austra-White and Colourline produced a HHN of 18.30 (65.34 per cent) and 19.50 (69.68 per cent), respectively during the last period of experiment and there was no significant difference ($P<0.05$).

The maximum HHN in both Austra-White and Colourline recorded during the period III, were 20.82 (74.36 per cent) and 22.05 (78.75 per cent), respectively.

Colourline produced a higher HHN of 77.59 (68.31 per cent) compared to Austra-White, which had a HHN of 74.31 (65.34 per cent) during the entire experimental period and the difference was not significant. Since the HHP of the first period was very low, it was not considered for calculation of HHP for the overall period of experiment.

Table 7. Period-wise hen housed egg number and per cent in Austra-White and Colourline

Period	Age in weeks	Austra-White		Colourline	
		HHN	HHP	HHN	HHP
I	21-24	1.13	4.04	1.09	3.89
II	25-28	13.86	49.50	13.86	49.50
III	29-32	20.82	74.36	22.05	78.75
IV	33-36	20.20	72.14	21.08	75.29
V	37-40	18.30	65.34	19.50	69.68
Overall	21-40	74.31	53.40 ± 6.32	77.59	58.42±6.58

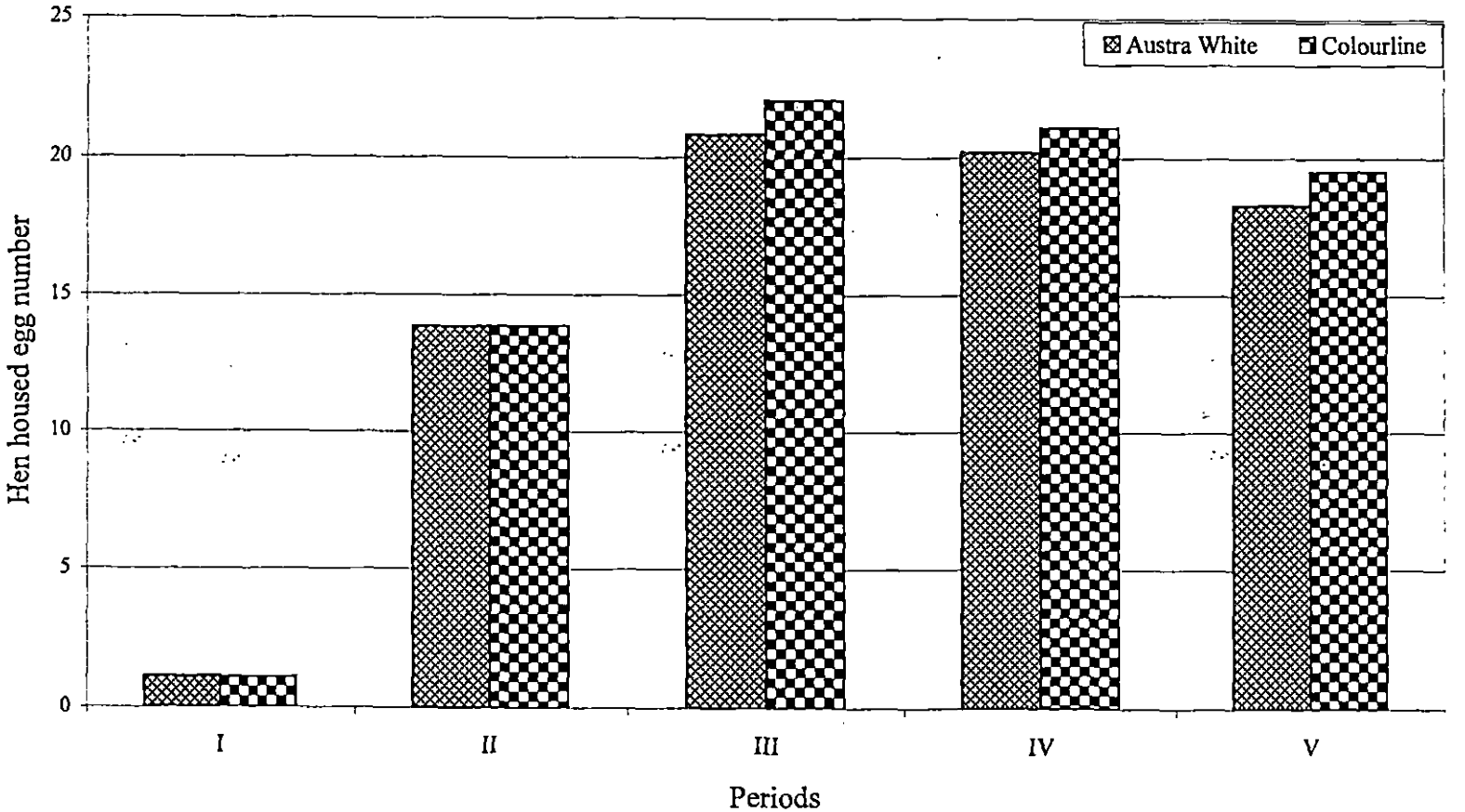

Fig. 4. Period-wise hen housed egg number in Austra-White and Colourline

4.4.3 Week Wise Hen Day Number (HDN) and Per Cent (HDP)

The HDN and HDP from 21 to 40 weeks are presented in Table 8.

The weekly HDN and HDP from 21 to 28 weeks of age in Austra-White were same as that of corresponding HHN and HHP since there was no mortality during this period.

The highest weekly HDP recorded was 5.49 (78.43 per cent) at 29th week. The HDN and HDP from 30 to 40 weeks of age in Austra-White were same except for 37th week. Since there was no mortality.

The weekly HDN and HDP from 21 to 40 weeks in Colourline were the same as that of corresponding HHN and HHP in all weeks except for the 38th week of age. The highest HDN recorded was 5.61 (80.14 per cent) at 31st and 32nd week of age. Due to the death of a bird at 38th week of age, the HDN was 4.94 (70.63 per cent) in Colourline.

4.4.4 Period Wise Hen Day Number (HDN) and Per Cent (HDP)

The period-wise HDN and HDP for Austra-White and Colourline are presented in Table 9.

The HDN and HDP for the periods I, II and IV were the same as that of HHN and HDP in Austra-White. The highest HDN and HDP recorded at period III was 21.23 (75.82 per cent). During this period two birds died. The HDN and HDP for the period V were 18.46 eggs and 65.92 per cent, respectively. During this period one bird died. The overall HDN from 21 to 40 weeks was 74.88.

The HDN and HDP in Colourline for the periods I, II, III and IV were the same as that of HHN and HDP. The HDN and HDP for the last period of experiment was 19.63 and 70.11 per cent, respectively. During this period a bird died. The overall HDN from 21 to 40 week was 77.71. Though the HDN and HDP in colour line were higher than the Austra-White, there was no significant difference.

Table 8. Week-wise mean hen day egg number and per cent in Austra-White and Colourline from 21 to 40 weeks of age

Period	Age in weeks	Austra-White		Colourline	
		HDN	HDP	HDN	HDP
I	21	0.01	0.14	--	--
	22	0.08	1.14	0.04	0.57
	23	0.18	2.57	0.19	2.71
	24	0.86	12.28	0.86	12.29
II	25	1.69	24.14	1.89	27.00
	26	2.96	42.29	3.06	43.71
	27	4.34	62.00	4.14	59.14
	28	4.87	69.57	4.77	68.14
III	29	5.49	78.43	5.27	75.29
	30	5.23	74.71	5.56	79.43
	31	5.44	77.71	5.61	80.14
	32	5.06	72.29	5.61	80.14
IV	33	5.36	76.57	5.34	76.29
	34	5.10	72.86	5.49	78.43
	35	4.91	70.14	5.16	73.71
	36	4.84	69.14	5.09	72.71
V	37	4.76	67.94	5.20	74.29
	38	4.72	67.43	4.94	70.63
	39	4.42	63.14	4.84	69.14
	40	4.56	65.14	4.64	66.29
Overall	25-40	4.63 ± 0.25	65.84 ± 3.51	4.78 ± 0.25	68.27 ± 3.57
	21-40	3.76 ± 0.44	53.48 ± 6.34	4.09 ± 0.38	58.42 ± 6.58

Table 9. Period-wise hen day egg number and per cent in Austra-White and Colourline

Period	Age in weeks	Austra-White		Colourline	
		HDN	HDP	HDN	HDP
I	21-24	1.13	4.04	1.09	3.89
II	25-28	13.86	49.50	13.86	49.50
III	29-32	21.23	75.82	22.05	78.75
IV	33-36	20.20	72.14	21.08	75.29
V	37-40	18.46	65.92	19.63	70.11
Overall	21-40	74.88	53.48 ± 6.34	77.71	58.42 ± 6.58

4.5 EGG WEIGHT

The mean egg weight for Austra-White and Colourline for the different periods is presented in Table 10 and Fig. 5.

The mean egg weight of Austra-White at 24th, 28th, 32nd, 36th and 40th week were 43.13 ± 0.60, 47.3 ± 0.34, 47.91 ± 0.40, 48.04 ± 0.40 and 49.23 ± 0.58 g, respectively. The overall mean egg weight from 21 to 40 weeks of age was 47.12 ± 1.05 g.

The mean egg weight of Colourline at 24th, 28th, 32nd, 36th and 40th week were 39.7 ± 0.92, 45.24 ± 0.31, 46.60 ± 0.09, 45.96 ± 0.30 and 46.31 ± 0.40 g, respectively. The overall mean egg weight from 21- 40 weeks was 44.76 ± 1.29 g. The overall mean egg weight of Austra-White in all periods was higher than that of Colourline. There was a significant difference ($P<0.05$) between Austra-White and Colourline for overall mean egg weight.

4.6 FEED CONSUMPTION

Mean daily feed consumption in Austra-White and Colourline from 21 to 40 weeks is presented in Table 11 and Fig. 6. (per bird per day basis).

The mean feed consumption during the period I was 93.03 ± 0.23 g per bird per day for Austra-White. In subsequent periods the mean daily feed consumption were 101.25 ± 0.17, 101.30 ± 0.20, 118.37 ± 0.40 and 106.41 ± 0.57 g, respectively. The overall mean daily feed consumption from 21 to 40 weeks was 104.07 ± 4.16 g.

In Colourline the mean daily feed intake during period I was 92.96 ± 0.23 g per bird per day. The feed consumption from period II to V were 101.50 ± 0.16, 106.64 ± 0.51, 117.79 ± 0.44 and 113.39 ± 0.61 g, respectively. The overall mean daily feed consumption from 21 to 40 weeks of age was 106.46 ± 4.37 g per bird. There was no significant difference between Austra-White and Colourline in the overall mean daily feed intake.

Table 10. Period-wise mean egg weight in Austra-White and Colourline, g

Period	Age in weeks	Egg weight (g)	
		Austra-White	Colourline
I	24	43.13 ± 0.60^{a}	39.7 ± 0.92^{b}
II	28	47.3 ± 0.34^{a}	45.24 ± 0.31^{b}
III	32	47.91 ± 0.40^{a}	46.60 ± 0.09^{b}
IV	36	48.04 ± 0.40^{a}	45.96 ± 0.30^{b}
V	40	49.23 ± 0.58^{a}	46.31 ± 0.40^{b}
Overall	21- 40	47.12 ± 1.05^{a}	44.76 ± 1.29^{b}

The mean values carrying different superscripts within a row differed significantly ($P<0.05$)

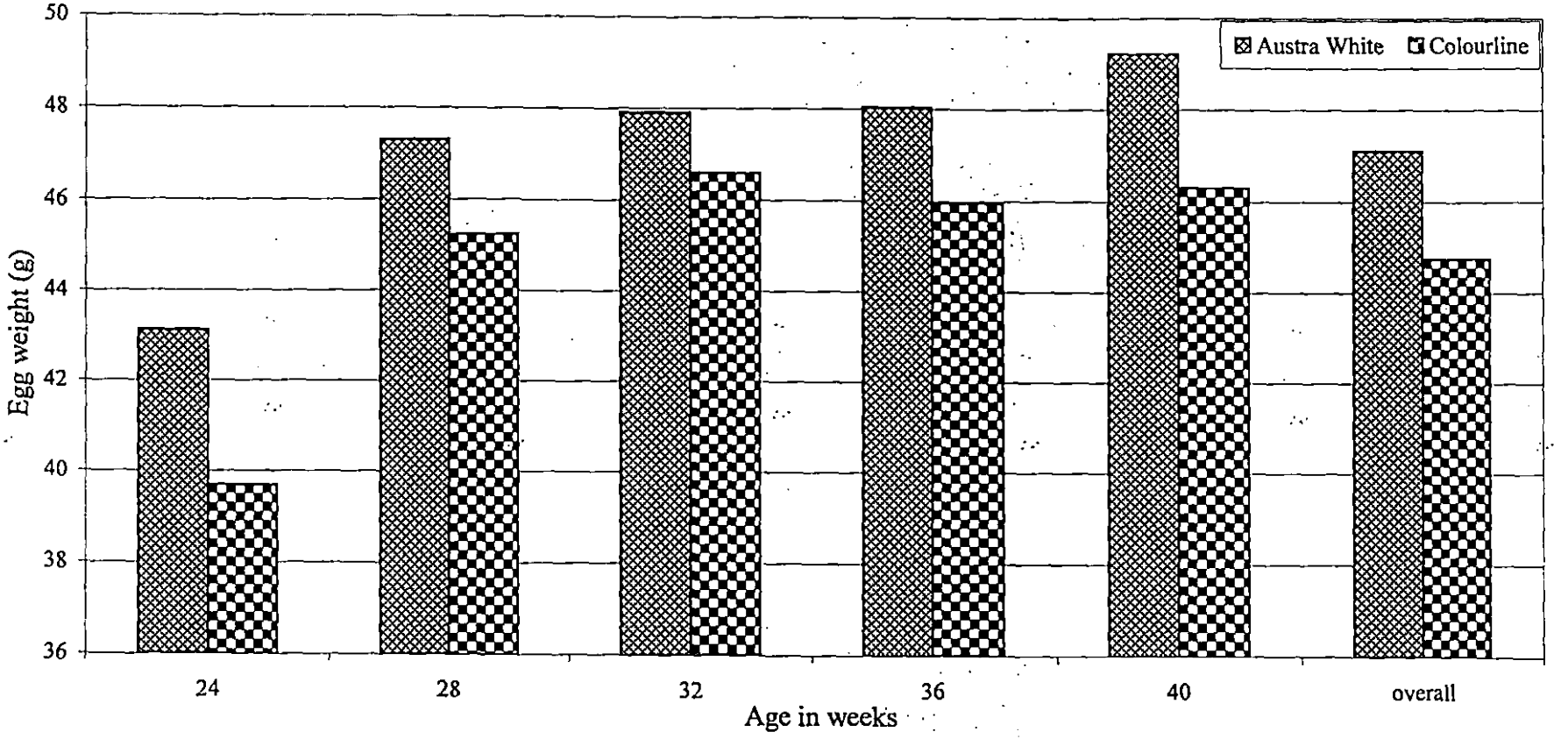

Fig. 5. Period-wise mean egg weight in Austra-White and Colourline

Table 11. Mean daily feed consumption in Austra-White and Colourline from 21 to 40 weeks of age, g

Period	Age in weeks	Mean daily feed consumption (g)	
		Austra-White	Colourline
I	21-24	93.03 ± 0.23	92.96 ± 0.23
II	25-28	101.25 ± 0.17	101.50 ± 0.16
III	29-32	101.30 ± 0.20	106.64 ± 0.51
IV	33-36	118.37 ± 0.40	117.79 ± 0.44
V	37-40	106.41 ± 0.57	113.39 ± 0.61
Overall	21-40	104.07 ± 4.16	106.46 ± 4.37

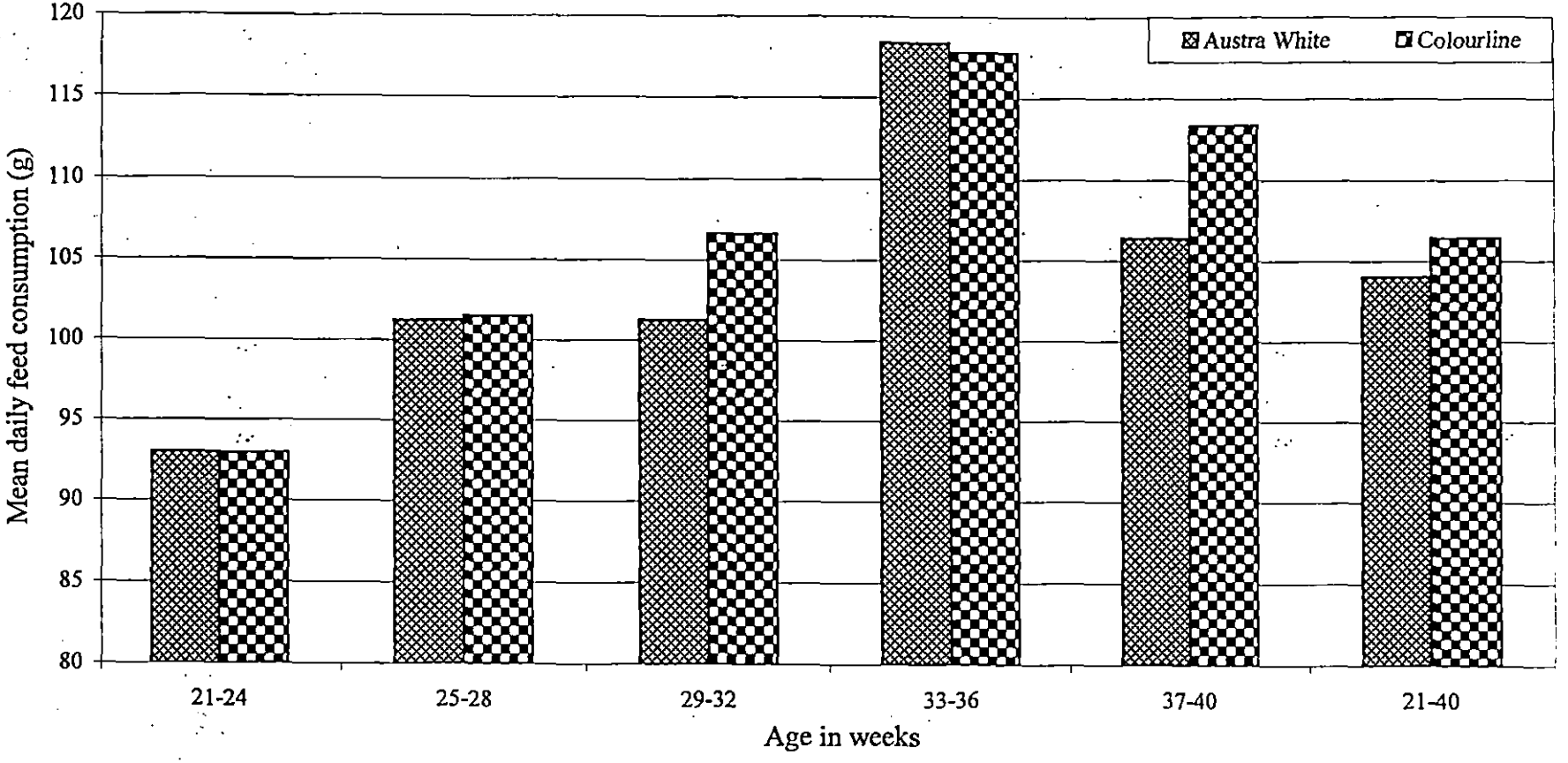

Fig. 6. Mean daily feed consumption in Austra-White and Colourline from 21 to 40 weeks of age

4.7 FEED CONVERSION RATIO (FCR)

4.7.1 Feed Conversion Ratio (per dozen eggs)

The mean FCR per dozen eggs in Austra-White and Colourline are presented in Table 12 and Fig. 7. Since the egg production was very low during the period I, (21 to 24 weeks) it was not considered for statistical analysis.

The mean FCR in Austra-White during the periods II, III, IV and V were 2.55 ± 0.15, 1.65 ± 0.05, 2.02 ± 0.07 and 2.04 ± 0.10, respectively. The overall mean FCR from 25 to 40 weeks of age was 2.07 ± 0.18.

In Colourline the FCR during the periods II, III, IV and V were 2.48 ± 0.09, 1.63 ± 0.03, 1.90 ± 0.03 and 1.91 ± 0.08, respectively. The overall mean FCR from 25 to 40 weeks of age was 1.98 ± 0.18.

On a comparison between Austra-White and Colourline birds it was observed that the overall mean FCR did not differ significantly.

4.7.2. Feed Conversion Ratio (per kg egg mass)

The mean feed conversion ratio per kg egg mass from 21 to 40 weeks of age in Austra-White and Colourline are presented in Table 13. Since the egg production was very low during first period (21 to 24 weeks) it was not considered for statistical analysis.

In Austra-White the mean feed conversion ratio during the periods II, IV and V were 4.48 ± 0.27, 3.54 ± 0.14 and 3.44 ± 0.17, respectively. The FCR recorded in period III (2.88 ± 0.08) was better than other periods. The overall mean FCR from 25 to 40 weeks of age was 3.59 ± 0.33.

The FCR in Colourline during the periods II, IV and V were 4.59 ± 0.15, 3.45 ± 0.14 and 3.42 ± 0.13, respectively. Among all the periods the better FCR was recorded in the period III (2.91 ± 0.06). The overall mean FCR from 25 to 40 weeks was 3.59 ± 0.35. On a comparison between Austra-White and Colourline birds, it was observed that the overall mean FCR did not differ significantly.

Table 12. Feed conversion ratio in Austra-White and Colourline from 21 to 40 weeks of age, per dozen eggs

Period	Age in weeks	Feed conversion ratio (per dozen eggs)	
		Austra-White	Colourline
I	21-24	59.96 ± 29.25	67.88 ± 29.05
II	25-28	2.55 ± 0.15	2.48 ± 0.09
III	29-32	1.65 ± 0.05	1.63 ± 0.03
IV	33-36	2.02 ± 0.07	1.90 ± 0.03
V	37-40	2.04 ± 0.10	1.91 ± 0.08
Overall (II-V)	25-40	2.07 ± 0.18	1.98 ± 0.18

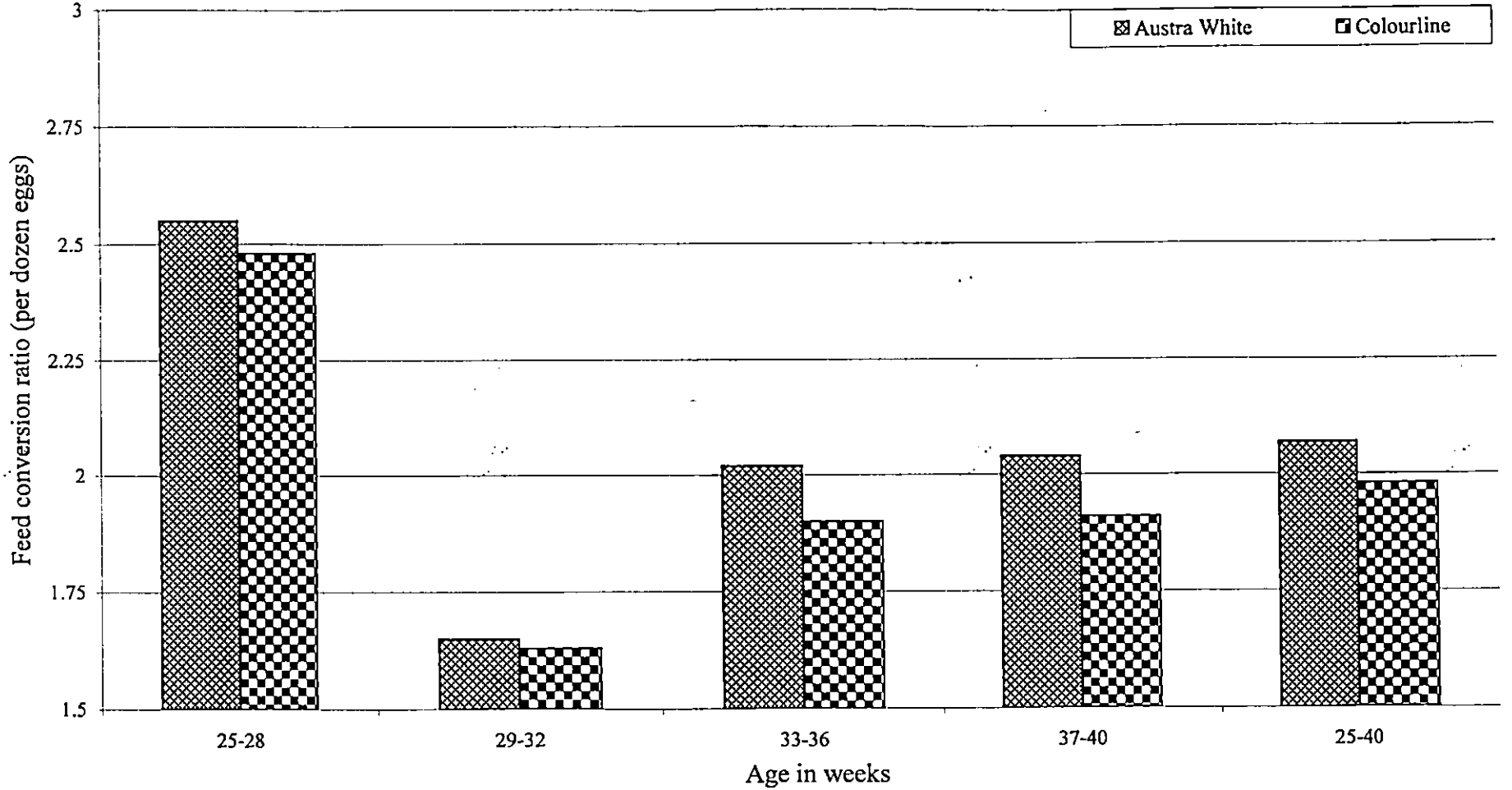

Fig. 7. Feed conversion ratio in Austra-White and Colourline from 21 to 40 weeks of age

Table 13. Feed conversion ratio from 21 to 40 weeks of age in Austra-White and Colourline, per kg egg mass

Period	Age in weeks	Feed conversion ratio (per kg egg mass)	
		Austra-White	Colourline
I	21-24	78.05 ± 24.56	145.47 ± 60.83
II	25-28	4.48 ± 0.27	4.59 ± 0.15
III	29-32	2.88 ± 0.08	2.91 ± 0.06
IV	33-36	3.54 ± 0.14	3.45 ± 0.14
V	37-40	3.44 ± 0.17	3.42 ± 0.13
Overall mean	21-40	18.48 ± 24.37	31.96 ± 28.33
	25-40	3.59 ± 0.33	3.59 ± 0.35

4.8 LIVABILITY

The per cent livability in Austra-White and Colourline birds at different ages from 21 to 40 weeks are presented in Table 14 and Fig. 8. The result showed that overall livability was 97 per cent in Austra-White and 99 per cent in Colourline. The total number of birds died was three in Austra-White and one in Colourline during the experimental period. There was no significant difference between Austra-White and Colourline in livability per cent.

4.9 PLUMAGE COLOUR AND EGGSHELL COLOUR

The Austra-White had a uniform plumage pattern with black spots on a dull white background on all parts of the body and the eggshell colour was tinted. Colourline birds were multi coloured (red, black, white, buff and their combination of colours) with various feather patterns (pencilling, autosomal barring, single lacing and double lacing). The eggshell colour was brown.

4.10 EGG QUALITY

The egg quality traits were measured at 32 weeks of age and the results are presented in Table 15.

The mean shape index of eggs at 32 weeks of age was higher in Colourline (77.67 ± 0.33) than in the Austra-White (76.25 ± 0.37). The mean values were compared and significant difference ($P<0.05$) was noticed between Colourline and Austra-White.

For Austra-White and Colourline, the mean albumen index was 0.1080 ± 0.004 and 0.1142 ± 0.002 and the mean yolk index value was 0.4257 ± 0.007 and 0.4439 ± 0.007, respectively. The mean values of both these indices did not differ statistically.

The mean shell thickness in Austra-White (0.3889 ± 0.117 mm) and Colourline (0.3638 ± 0.006 mm) did not differ significantly.

A

B

C

D

Plumage colour : A. Colourline B. Austra-White

Egg shellcolour : C. Austra-White D. Colourline

Plate 1. Plumage colour and egg shellcolour in Austra-White and Colourline

Table 14. Per cent livability in Austra-White and Colourline from 21 to 40 weeks of age

Period	Per cent livability	
	Austra-White	Colourline
I	100.00	100.00
II	100.00	100.00
III	98.00	100.00
IV	100.00	100.00
V	98.98	99.00
Overall 21-40	97	99

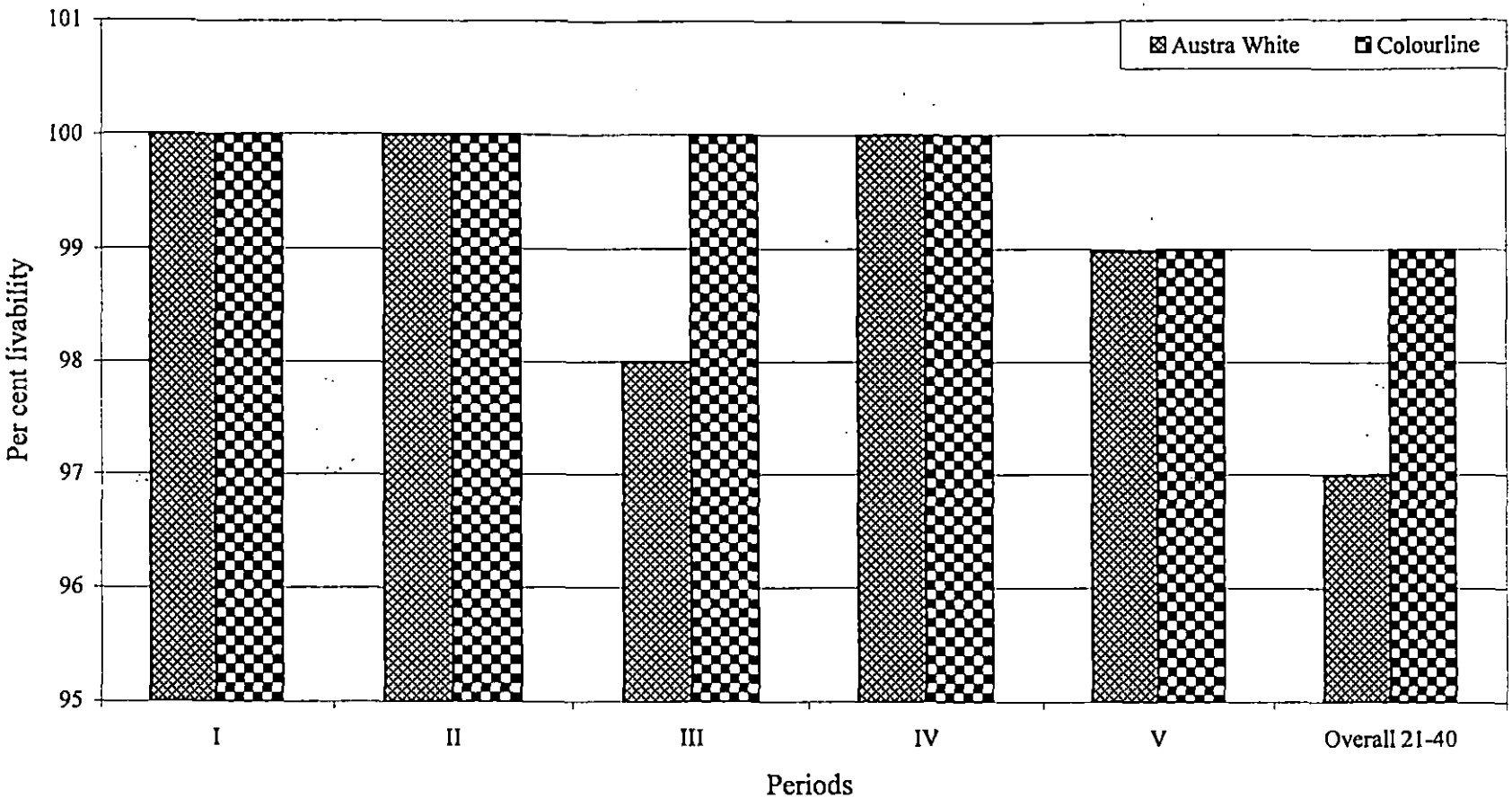

Fig. 8. Per cent livability in Austra-White and Colourline from 21 to 40 weeks of age

Table 15. Egg quality traits in Austra-White and Colourline at 32 weeks of age

SI.No.	Trait	Egg quality traits	
		Austra-White	Colourline
1	Shape index	76.25 ± 0.37^{b}	77.67 ± 0.33^{a}
2	Albumen index	0.1080 ± 0.004	0.1142 ± 0.002
3	Yolk index	0.4257 ± 0.007	0.4439 ± 0.007
4	Shell thickness (mm)	0.3889 ± 0.117	0.3638 ± 0.006
5	Haugh Unit score	88.06 ± 1.39	90.52 ± 0.91

The mean values carrying different superscript within the trait differed significantly ($P<0.05$).

The Haugh Unit score in Austra-White and Colourline was 88.06 ± 1.39 and 90.52 ± 0.91, respectively and there was no significant difference between them.

4.11 ECONOMICS

The economics of egg production over feed cost from 25 to 40 weeks of age is presented in Table 16. The total feed consumed was 1,196.4 kg in Austra-White and 1,229.4 kg in Colourline. The feed consumed per egg was 165 g in Austra-White and 160 g in Colourline. The total number of eggs produced during the entire period of experiment was 7,241 in Austra-White and 7,650 in Colourline. The feed cost per egg in colour line was five paise less than Austra-White.

Table 16. Economics of egg production over feed cost from 25 to 40 weeks of age in Austra-White and Colourline

Sl. No.	Particulars	Austra-White	Colourline
1.	Feed intake (kg)	1196.4	1229.4
2.	Total number of eggs produced	7241	7650
3	Feed consumed per egg (g)	165	160
4	Cost of feed (Rs/kg)	11	11
5	Cost of feed per egg (Paise)	181	176

Discussion

5. DISCUSSION

An experiment was conducted to evaluate and compare Austra-White and Colourline crossbred chicken. The Austra-White chicken was developed for backyard rearing in the households of Kerala in 1980. The University Poultry Farm has recently developed a coloured breed cross Colourline for backyard. This study envisaged the evaluation of both Austra-White and Colourline under farm conditions so that the utility of Colourline could be established. The performance of the two crosses for the various production traits have been discussed.

5.1 METEOROLOGICAL PROFILE

The meteorological data of the experimental period presented in Table 3 revealed that hot and humid conditions prevailed through out the experimental period. The mean maximum temperature ranged between 33.2°C and 34.7°C. The per cent relative humidity in the forenoon ranged from 66 to 88 per cent. The high temperature and humidity might have induced heat stress in the birds. The delay in attaining peak production may be due to the high environmental temperature and relative humidity.

5.2 BODY WEIGHT

5.2.1 Body Weight at 20 Weeks of Age

Body weight at 20 weeks of age (BW20) represent the pullet body weight and the overall body weight for Austra-White at 20 weeks was 1215.60 ± 20.61 g (Table 4). The range of BW20 in different replicates showed that the Austra-White is a light bird. The breeds involved are Australorp and White Leghorn is also having light weight. Even though the Australorp is dual purpose breed, the line maintained in the farm has a low body weight. Since light birds are more

suitable for egg production, the Austra-White could also be included in this category. The BW20 observed in the study is comparable to the report of Radhakrishnan and Ramakrishnan (1982).

The Colourline birds were heavier than Austra-White and difference was statistically ($P<0.05$) significant. The mean BW20 was 1493.65 ± 14.02, which was 278.05 g higher than Austra-White. Therefore Colourline appeared to be medium sized bird. As body weight is a factor that influences the feed consumption, a higher body weight is disadvantageous to layer type birds. Since the backyard birds are also utilized for meat purpose, a medium sized bird could be suitable for this type rearing. But the feed consumption data (Table 11) revealed that mean daily feed intake in Colourline was similar to Austra-White. This implies that though the body weight was higher, it was not reflected in the feed consumption. Therefore the higher body weight in Colourline is not disadvantageous because it does not increase the production cost. The present results are comparable with the reports of Jain and Sharma (1977) in Desi x White Leghorn, Jayanthy (1992) in Desi x Austra-White and Sridharan (1998) in Austra-White.

5.2.2 Body Weight at 40 Weeks of Age

Body weight at 40 weeks of age (BW40) is considered as adult weight and it is helpful in comparison of breeds and breed crosses. The Austra-White averaged 1424.40 ± 28.01 g (Table 4) at 40 weeks of age. The magnitude of increase was 265.72 g only. This showed that the gain in body weight was minimum and there is no tendency to deposit abdominal fat. The gain in body weight was lower in comparison to the reports of Radhakrishnan and Ramakrishnan (1982), Nair and Bhattacharyya (1984), Beena (1995) and Sridharan (1998).

The body weight in Colourline ranged from 1783.0 ± 54.03 g to 1947.0 ± 57.87 g at 40 weeks of age, with an overall mean value of 1863.15 ± 13.46 g.

The BW 40 in Colourline was significantly higher when compared to Austra-White. The BW 40 showed that Colourline is a medium sized bird. The increase in body weight from 20 weeks was 369.5 g only. Therefore the bird did not have the tendency to put up the fat in the body. This character is of advantage as a backyard layer. Birds gaining high body weight and those, which tend to deposit abdominal fat become poor layers, thus depleting its utility.

The body weight character (BW 20 and BW 40) indicated that Austra-White and Colourline are suitable for a layer type bird. The trend of body weight and body weight gain in both the crosses were similar though the Colourline was heavier than Austra-White.

5.3 AGE AT SEXUAL MATURITY

The overall mean age at first egg in both the flock was 158.9 days. Similarly, the age at 50 per cent production was comparable between Austra-White and Colourline (Table 5) with mean values of 177.7 ± 1.37 and 175.1 ± 1.28 days, respectively. These results indicated that egg production as good as that of Austra-White could be expected from Colourline also. The similarity in age at first egg is also reflected in age at 50 per cent production. Since Austra-White was an accepted layer type bird for backyard and egg production similar to them may also make the Colourline acceptable. Lal and Chhabra (1975) observed that the age at first egg averaged 182 and 168 days in Australorp and Australorp x New Hampshire, respectively, where as Mishra *et al.* (1978) observed that the age at sexual maturity of Rhode Island Red was 197.39 days. The results obtained in the present study is lower to that of Lal and Chhabra (1975) and Mishra *et al.* (1978) and might be due to the differences in the lines involved.

The results also make it clear that both Austra-White and Colourline are not suitable as commercial layers since their mean age at first egg was 23 weeks

and mean age at 50 per cent production was 25 weeks. This might be due to the higher age at first egg in Australorp, which is used as the male line.

5.4 EGG PRODUCTION

The data on hen housed egg number, week wise as well as period wise (Table 6 and Table 7) indicated that Austra-White is an average layer, which yields only 74.31 eggs upto 40 weeks of age (53.40 ± 6.32 per cent). Though the first egg was received at 147th day, an increase in egg production was noticed only from 24th week of age. The peak production of 77.71 per cent also reflects the medium production ability of Austra-White and interpolation of production for first year of laying indicated a yield of 190 eggs per bird. This egg number is higher compared to egg production of Desi and their crosses. Acharya and Kumar (1971) reported hen day per cent of 33.31 in Desi x Rhode Island Red followed by 28.78 in Rhode Island Red x Desi, while it was 27.47 in Rhode Island Red and 22.8 in Desi for a period of 3 months. Aggarwal and Sapra (1972) recorded an average hen day production of 26.44 eggs in desi and 22.19 eggs in Naked Neck birds. Sah *et al.* (1985) observed a hen day production of 19.11 per cent in desi birds.

The Colourline showed a hen housed number of 77.59 eggs upto 40 weeks of age (55.49 ± 6.50 per cent). A comparison with Austra-White revealed that the Colourline birds were superior by 3.2 eggs per bird (Table 7). The week wise performance depicted in Fig 3 also indicated that the performance of Colourline was very close to Austra-White upto 29 weeks of age. For 30 weeks the Colourline birds showed a higher egg production (Table 6). Therefore the Colourline could be expected to produce 200 eggs in first laying cycle and they could be considered as a layer type bird for back yard.

The week wise mean hen day number and per cent in Austra-White and Colourline was very close to hen housed number and per cent, since the mortality

was very low. The results obtained in the present study showed close association with that of Dey *et al.* (1987), Sridharan (1998) and Devi *et al.* (2003).

5.5 EGG WEIGHT

The data on egg weight revealed that the initial egg weight of 43.13 ± 0.60 g gradually increased to 49.23 ± 0.58 g in Austra-White at 40 weeks of age (Table 10). The eggs could be classified as medium size as per Indian standard classification. In Colourline, initial egg weight was 39.7 ± 0.92 g, which increased to 46.31 ± 0.40 g at 40^{th} week. The eggs of the Colourline may just qualify for medium eggs. The Austra-White shows a clear superiority over Colourline for this trait. It may be noted that the Colourline have a higher egg number and the trend was reversed in egg weight (Table 7). The lower egg number was compensated by higher egg weight in Austra-White, whereas the higher egg number in Colourline was balanced with lower egg weight. The egg mass output by both the lines was similar because of this phenomenon.

The overall mean egg weight observed in this study in Austra-White and Colourline was in agreement with the report of Chowdhury *et al.* (1983) in White Leghorn x Rhode Island Red (46.8 g) and in Rhode Island Red (46.7 g).

Since the egg number is more important in a backyard system of production, the lower egg weight in the Colourline may not be disadvantageous. Moreover they have the advantage of brown shell colour.

5.6 FEED CONSUMPTION

The mean daily feed consumption data (Table 11) indicated a similar feed intake in Austra-White and Colourline, i.e. 104.07 ± 4.16 and 106.46 ± 4.37 g, respectively. This was not expected since the Colourline birds were heavier than Austra-White at 20 weeks and 40 weeks of age. The higher body size has not been reflected in feed consumption. Therefore the cost of production remains

similar in Austra-White and Colourline. This could be the advantageous for the Colourline. Aggarwal and Sapra (1972) recorded the feed consumption of Naked Neck (137.78 ± 7.83 g), Aseel (135.75 ± 8.63 g) and Desi (128.93 ± 3.87 g), which was higher than the present study. A similar report was obtained by Babu *et al.*, (1988) in Austra-White (142.04 g) and this might be due to higher body weight at 20 weeks (1523.4 g) and 40 weeks (1626.4 g) of age. Another factor, which might have caused lower feed consumption in Colourline, may be the lower egg size in this line. Jayanthy (1992) recorded a mean daily feed consumption in Desi x New Rock (106.61 ± 4.17 g) and Desi x Austra-White (104.95 ± 5.20) which was comparable with the present study. The mean maximum environmental temperature during the entire experimental period fell within the range of 33 to35°C (Table 3). The high environmental temperature might also be a cause for the reduction in feed intake.

5.7 FEED CONVERSION RATIO (FCR)

The data on feed conversion ratio (per dozen eggs) set out in Table 12 and the feed conversion ratio (per kg egg mass) showed in Table 13 revealed that the feed conversion ratio was high during the initial period when the birds where in the start of production, but improved to a more acceptable values from the second period onwards. The overall mean FCR (per dozen eggs) from 25 to 40 weeks of age was 2.07 ± 0.18 and 1.98 ± 0.18 in Austra-White and Colourline, respectively. The FCR observed in the present study was better than that reported for crossbred populations (Jain *et al.*1978b). It is evident from the data that Colourline birds had an increased feed consumption pattern throughout the experimental period and the rate of egg production was also higher compared to the Austra-White. The higher feed consumption and egg production might be the contributing factor to the improved feed conversion ratio. Reduced feed wastage and sound managemental practices followed during the experimental period might have also contributed to the improvement of this trait.

The FCR obtained in the present study was better than that reported by various research works (Howlider and Ahmed, 1982; Sridharan, 1998; Jayasree, 2000).

5.8 LIVABILITY

The data on livability (Table 14) showed an excellent performance of the crosses for this trait. The overall livability was 97 and 99 per cent in Austra-White and Colourline, respectively. From the present study it could be opined that Austra-White as well as Colourline could be utilised for backyard rearing. The livability per cent observed in this study was high compared to that reported by Radhakrishnan (1981), Jayanthy (1992) and Sridharan (1998). This might be due to the good managemental practices followed during the period of study.

5.9 PLUMAGE COLOUR AND SHELL COLOUR

The birds of the Austra-White had a uniform plumage pattern with black spots on a dull white background on all parts of the body. The white colour is due to the dominant white gene in White Leghorn. The birds of Colourline were multicoloured with various feather patterns. This may be added advantage since there is a consumer preference for coloured bird for backyard. The genes for plumage colour and feather pattern have been inherited from the breeds utilised in synthesis of this line.

The eggshell colour in Austra-White was tinted whereas in Colourline it was brown. It might be due to the breeds involved in the crosses. Since the brown coloured eggs obtained from backyard fetches premium rate in market than commercial white-shelled egg, the Colourline eggs have an advantage over Austra-White eggs.

5.10 EGG QUALITY

The egg quality traits except shape index were similar in both Austra-White and Colourline (Table 15).

Shape index was significantly ($P<0.05$) higher in Colourline compared to Austra-White. The result obtained in the present study was in agreement those reported by Kumar *et al.* (1971a) and Padhi *et al.* (1998).

Albumen index recorded in Austra-White and Colourline averaged 0.1080 ± 0.004 and 0.1142 ± 0.002, respectively. Though the value was higher in Colourline, there was no significant difference between the groups. The value obtained in the study was higher to Pandey *et al.* (1987), Salahuddin and Howlider (1991), Padhi *et al.* (1998) and Jayasree (2000).

The yolk index recorded in the experiment was 0.4257 ± 0.007 and 0.4439 ± 0.007 for Austra-White and Colourline, respectively. According to Haque *et al.* (2001) the yolk index was higher in pure breeds than that of cross breeds. The result obtained in the present study is in agreement with Pandey *et al.* (1987) and Padhi *et al.* (1998).

Shell thickness in Austra-White and Colourline was 0.3889 ± 0.117 and 0.3638±0.006 mm, respectively. It could be seen that the Colourline recorded higher value than Austra-White but differences were non significant ($P<0.05$). The shell thickness obtained in the present study was higher than that found in the studies of Kumar *et al.* (1971a) and Jain *et al.* (1978a). Since the two crosses used in the present study are intended for rearing under backyard condition, the better shell thickness might be considered advantageous.

The Haugh Unit scores obtained in the experiment were 88.06 ± 1.39 and 90.52 ± 0.91 for Austra-White and Colourline, respectively. The values obtained in the study were higher than that reported by Jain *et al.* (1978a), Pandey *et al.*

(1987) and Padhi *et al.* (1998), Jayanthy (1992) and Jayasree (2000). The difference may be due to the lines and the seasons of measurement.

5.11 ECONOMICS

Cost of feed per egg in Austra-White (181 paise) was higher than Colourline (176 paise) as indicated in Table 16. This might be due to the higher egg production in Colourline. The result obtained in the present study was lower compared to that of John (2000) who reported cost of feed per egg in Naked Neck x White Leghorn as 202.12 paise and in Naked Neck x New Hampshire as 208.94 paise. This might be due to the higher feed consumed per bird. Although the cost of feed per egg was on the higher side when compared to commercial strains, it could be reduced considerably under backyard conditions.

The study was conducted to evaluate and compare the production performance of Colourline with Austra-White and it is evident from the study that Colourline birds might also be considered for backyard rearing. The Colourline birds equaled Austra-White in most of the traits and excelled in body weight, egg production and feed conversion ratio. The other advantages for Colourline are brown-shelled egg and multicoloured plumage. All these characters make the Colourline birds more suitable for backyard rearing. However field trials should be conducted for the confirmation of the present results.

Summary

6. SUMMARY

An experiment was conducted at Kerala Agricultural University Poultry Farm, Mannuthy to evaluate and compare the production performance of Austra-White and Colourline in deep litter system of rearing.

One hundred (100) pullets each of Austra-White and Colourline at the age of 18 weeks were housed in identical pens in ten replicates each at the rate of 10 birds per replicate. Layer mash with BIS specifications was fed throughout the experimental period. Standard routine management practices were followed in the study. The experimental period ranged from 21 to 40 weeks of age and the production performance of birds for five periods of 28-days each were recorded during the period from December, 2002 to May, 2003. Data were analysed statistically and the following results were obtained.

1. The mean body weight (BW) at 20 weeks of age was 1215.6 ± 20.61 g in Austra-White and 1493.65 ± 14.02 g in Colourline and the BW at 40 week was 1424.40 ± 28.01 g in Austra-White and 1863.15 ± 13.46 g in Colourline. BW of Colourline was significantly higher than that of Austra-White both at 20 and 40 weeks of age ($P<0.05$).

2. The age at sexual maturity estimated as age at first egg and age at 50 per cent production revealed that the mean values were 158.9 ± 2.26 days and 177.7 ± 1.37 days in Austra-White and 158.9 ± 1.96 days and 175.1 ± 1.28 days in Colourline, respectively.

3. The overall mean weekly HHN from 25 to 40 weeks of age was 4.60 ± 0.24 in Austra-White and 4.79 ± 0.25 in Colourline with HHP of 65.74 ± 3.49 and 68.39 ± 3.60, respectively and the difference was not statistically significant.

4. The overall mean weekly HDN was 4.63 ± 0.25 and 4.78 ± 0.25 with a corresponding HDP of 65.84 ± 3.51 and 68.27 ± 3.57 in Austra-White and Colourline, respectively and the difference was statistically non-significant.

5. The highest weekly HHN of 5.44 and 5.61 with corresponding percentages of 77.71 and 80.14 were recorded at the age of 31st week in Austra-White and Colourline, respectively.

6. The overall mean daily feed consumption during the period from 21 to 40 weeks of age was 104.07 ± 4.16 g in Austra-White and 106.46 ± 4.37 g in Colourline and the difference between the genetic groups was statistically non significant.

7. The overall mean feed conversion ratio on the basis of dozen eggs from 25 to 40 weeks of age was 2.07 ± 0.18 and 1.98 ± 0.18 in Austra-White and Colourline, respectively.

8. The overall mean feed conversion ratio based on per kg egg mass from 25 to 40 weeks of age was 3.59 ± 0.33 and 3.59 ± 0.35 in Austra-White and Colourline, respectively. The mean values did not differ significantly.

9. The overall mean egg weight recorded during the period from 21 to 40 weeks of age was 47.12 ± 1.05 and 44.76 ± 1.29 in Austra-White and Colourline, respectively and the difference was statically significant ($P < 0.05$).

10. The overall mean shape index in Austra-White and Colourline at 32nd week of age was 76.25 ± 0.37 and 77.67 ± 0.33, respectively and the difference was statistically significant ($P< 0.05$).

11. The overall albumen index was 0.1080 ± 0.004 and 0.1142 ± 0.002 in Austra-White and Colourline, respectively and the figures did not differ significantly.

12. The overall mean yolk index in Austra-White and Colourline was 0.4257 ± 0.007 and 0.4439 ± 0.007, respectively and statistically they were similar.

13. The overall mean shell thickness in Austra-White and Colourline was 0.3889 ± 0.117 and 0.3638 ± 0.006 mm, respectively and the difference was non significant.

14. The mean value of Haugh Unit score was 88.06 ± 1.39 and 90.52 ± 0.91 in Austra-White and Colourline, respectively and they were statistically similar.

15. The overall livability in Austra-White and Colourline was 97 and 99 per cent, respectively.

16. The eggshell colour was tinted in Austra-White and brown in Colourline.

17. The plumage colour was uniform dull white background with black spots in Austra-White whereas it was multicoloured in Colourline.

18. The feed cost per egg was 181 paise in Austra-White 176 paise in Colourline.

From the above findings, it could be observed that Colourline birds might also be considered for backyard rearing. The Colourline birds equalled Austra-White in most of the traits and excelled in body weight, egg production and feed conversion ratio. The other advantages for Colourline are brown-shelled egg and multicoloured plumage. All these characters make the Colourline birds suitable for backyard rearing. However, field trials should be conducted for the confirmation of the present results.

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PERFORMANCE OF CROSSBRED COLOUR LINE AND AUSTRA-WHITE CHICKEN FOR LAYER TRAITS

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Abstract of a thesis submitted in partial fulfilment of the requirement for the degree of

Master of Veterinary Science

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2003

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ABSTRACT

An experiment was conducted at Kerala Agricultural University Poultry Farm, Mannuthy, to evaluate and compare the production traits of Austra-White and Colourline under farm conditions. One hundred pullets of each crossbred were housed in identical pens (ten birds each) and production performance was evaluated for five periods (each 28 days) from 21 to 40 weeks of age. Standard feeding and managemental practices were followed throughout the study.

The Colourline birds were heavier than Austra-White at 20 and 40 weeks of age. The mean body weight for Colourline and Austra-White was 1493.65 ± 14.02 g vs. 1215.60 ± 20.61 g and 1863.15 ± 13.46 vs. 1424.40 ± 28.01 at 20 and 40 weeks of age, respectively. The age at first egg was similar in Austra-White (158.9 ± 2.26 days) and Colourline (158.9 ± 1.96 days). The age at 50 per cent production was 177.7 ± 1.37 days in Austra-White and 175.1 ± 1.28 days in Colourline. The overall mean hen housed number upto 40 weeks of age was 74.31 in Austra-White and 77.59 in Colourline. The hen day production was 74.88 in Austra-White and 77.71 in Colourline. The overall mean egg weight was 47.12 ± 1.05 g in Austra-White and 44.76 ± 1.29 g in Colourline

The mean daily feed consumption from 21 to 40 weeks of age was 104.07 ± 4.16 g in Austra-White and 106.46 ± 4.37 g in Colourline. The feed conversion ratio was 2.07 ± 0.18 (per dozen eggs) in Austra-White and 1.98 ± 0.18 (per dozen eggs) in Colourline, 3.59 ± 0.33 (per kg egg mass) in Austra-White and 3.59 ± 0.35 (per kg egg mass) in Colourline. The shape index was 76.25 ± 0.37 in Austra-White and 77.67 ± 0.33 in Colourline. The albumen index was 0.1080 ± 0.004 in Austra-White and 0.1142 ± 0.002 in Colourline. The yolk index was 0.4257 ± 0.007 in Austra-White and 0.4439 ± 0.007 in Colourline. The shell thickness was 0.3889 ± 0.117 mm in Austra-White and 0.3638 ± 0.006 mm in Colourline. The Haugh Unit score was 88.06 ± 1.39 in Austra-White and 90.52 ± 0.91 in Colourline. Austra-White had uniform plumage pattern with black spots

on a dull white background on all parts of the body and Colourline were multicoloured with various feather patterns. Egg shell was tinted in Austra-White while Colourline eggs were brown. The livability was 97 per cent in Austra-White and 99 per cent in Colourline. The cost of feed consumed per egg was 181 paise in Austra-White and 176 paise in Colourline. The results indicated that the *Colourline might be utilised for rearing in backyard.*